R - 5

PRELIMINARY

ECONOMIC VALUE GUIDE

FOREST SERVICE
CALIFORNIA REGION
AUGUST 4, 1972


United States
Department of
Agriculture
National Agricultural Library

PREFACE

Decision-making, like many social systems, has evolved from a relatively simple process to a much more complex system.

Today more quantitative information and a much broader array of decision elements must be incorporated into the decision-making process. The major elements now include ecologic, economic, and social considerations.

Many situations require that decisions be made on the basis of less than desirable information. We frequently can not postpone decisions until we have developed models of reality with a high potential for accurate prediction. Our premise is that decisions based on explicit information and simplified relationships coupled with intuition and good judgment and applied in a consistent manner are frequently better than decisions based on intuition and judgment alone.

This leads to a need for generalized analytical guidelines and methodologies. It is in this context that this analytical aid has been prepared.

This guide is intended to function as a support tool when better information is not available.

In order to keep up with the changing times and to improve our data base of relative values, it will be appreciated if readers and users would send comments and information on how this guide can be more useful and informative, to -- Division of Operation (R-5), P&MS Branch.

The contents of this analytical aid will be updated and supplemented as new and better information and methodologies are acquired.

R - 5 Economic Value Guide

R5 ECONOMIC VALUE GUIDE

By

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INTRODUCTION

PART I

A. Resource Planning

One purpose for using economics in natural resource management is to provide information regarding the economic and social effectiveness and impacts of various management alternatives.

The National Environmental Policy Act of 1969, Executive Direction and subsequent policy on implementation require that resource management actions be examined and evaluated from the standpoint of the significant beneficial and adverse effects. Social and Economic characterists should be examined as well as Ecological characteristics.

Resource analysis, (in the public sector and in the broadest sense), involves, among other things, an analysis of the feasible alternative means available to society for maintaining or improving social wealth, (Social wealth being all useful things, material and immaterial, free and scarce, enjoyed by people), and the distribution of social wealth among the people. This involves a comparative analysis of the beneficial effects (economic, social and ecological) and the costs (economic, social and ecological) between alternative courses of action available to society and between various members of society now and in the future.

The social science of economics has an important part to play in this process and has many key parts. These include production economics, consumption economics, distribution economics, fiscal economics, and welfare economics. The application of economics is dynamic and subject to constant change and adjustment. Through time and intensive efforts it has been realized that both qualitative or so-called subjective data as well as pure quantitative or objective data is needed to realistically analyze resource problems.

As stated in the Preface, many situations require that decisions be made on the basis of less than desirable information. We frequently cannot afford postponing decisions until we have developed models of reality with a high potential for accurate prediction. Our premise is that decisions based on limited explicit information and simplified relationships coupled with intuition and good judgment, and applied in a consistent manner are frequently better than decisions based on intuition and judgment alone.

Data inputs should be as objective as possible, whether they are described by the more recognizable and measurable quantitative terms, or in qualitative terms.

Within the decision making process the following tests should be applied to each alternative being examined:

1. Technical Feasibility - Can it be done?

2. Legal Feasibility - Is it lawful?

3. Political Feasibility - Can the decisions be sustained?

4. Economic Feasibility - Is it worth doing?

5. Financial Feasibility - Can sufficient funds be generated?

Within the context of the Economic test (Is it worth doing?) each alternative should use objective data as well as necessary subjective information to describe the beneficial and adverse changes which would likely result from each alternative in terms of:

A. National Economic Development (The value of the Nation's output of goods and services and improving national economic efficiency.) 1/

B. Environmental Quality (Enhancing or maintaining the quality of the environment concerning natural and cultural resources and ecological systems.)

C. Regional Development (The value of the Region's output of goods and services)

D. Social Factors (Income distribution to target groups, life, health, safety, etc.)

These four areas of concern will be discussed in more detail in Item B - Overall Framework for Analysis.

The role of economic analysis in the overall decision process should be kept in the proper perspective. It is imperative that economics be used as one of several criteria ... not as the sole criteria for management decisions. Economics itself, to be properly applied, must make use of several criteria (multiple indicators) that help show the economic aspects and implications of each management alternative as well as help to force new alternatives to the surface.

1/ Economic Efficiency is defined as the ratio of valued outputs or benefits to valued inputs or Costs.

Improvement in economic efficiency can take the form of (1) maximizing the value of useful outputs with a given set of valued inputs, or (2) minimizing the cost (valued inputs) of producing a given level of outputs(benefits).

Relative monetary values or ranges of values are one of the economic indicators utilized. These monetary values indicate or estimate the relative economic values of benefits and costs. They are valid for making certain kinds of comparisons or for use as a common denominator when making combinations which include a mix of resource outputs; that is, they can be added to reflect the relative total value of all outputs from a resource activity or management alternative. The use of these relative monetary values for different goods and services allows a person to consider the advantages and disadvantages of each alternative relative to a common unit of measurement.

A basic premise is that most values can be quantified in such a manner that they shed additional light on the differences between alternatives. This does not mean that a precisely correct and finite value to society can be calculated. It does mean that useful and reasonable ranges of values can be developed and used to advantage in shedding light on the implications of alternatives facing the decision-maker.

Resource decisions always imply relative values whether or not they are explicitly stated. Making values explicit and including them in the analysis can help to arrive at better decisions as well as improve the understanding of the objectives and goals being sought.

B. Overall Framework for Resource Analysis

The overall framework for accomplishing the Analysis follows the four major areas of concern mentioned in the previous section on Resource Planning:

A. National Economic Development
B. Environmental Quality
C. Regional Development
D. Social Factors

Within these broad categories are the Forest Service objectives as spelled out in the "Framework For The Future."

As shown on the following set of charts, benefits and costs included in the National Economic Development objective are usually measured in monetary terms. This allows for netting the beneficial and adverse effects in terms of a single monetary figure - a positive net benefit or a positive net loss (cost).

This is also true for a portion of the Regional Development objective. However, part of beneficial and adverse effects of the Regional Development objective, the Environmental Quality objective, and the Social factors can not be netted. These effects are usually measured in non-monetary terms and are therefore not capable of being reduced to a single measure of "goodness" or "badness". These non-monetary effects are usually measured in physical units or by a narrative discussion where physical units of measurement are not applicable.

This relative value guide is designed to assist the user in deriving only relative monetary values.

OBJECTIVES

NATIONAL ECONOMIC DEVELOPMENT (NED)

* INCREASE VALUE OF OUTPUT OF GOODS AND SERVICES
* IMPROVE NATIONAL ECONOMIC EFFICIENCY

ENVIRONMENTAL QUALITY (EQ)

* PROTECT OR IMPROVE NATURAL OR CULTURAL RESOURCES AND ECOLOGICAL SYSTEMS

REGIONAL DEVELOPMENT (RD)

* INCREASE REGIONAL INCOME
* INCREASE REGIONAL EMPLOYMENT
* IMPROVE ECONOMIC BASE, ENVIRONMENT AND SOCIAL WELL-BEING

DECISION DISPLAY SCHEME

	BENEFICIAL	ADVERSE	NET
NATIONAL ECONOMIC DEVELOPMENT	*	*	*
ENVIRONMENTAL QUALITY	*	*	
REGIONAL DEVELOPMENT	*	*	*
SOCIAL FACTORS	*	*	

PLAN EFFECTS

NED OBJECTIVE

BENEFICIAL	ADVERSE	NET
INCREASED OUTPUT	RESOURCES REQUIRED	EFFECTS
EXTERNALITIES	EXTERNALITIES	CAN BE
USE OF UNEMPLOYED RESOURCES	DISPLACED RESOURCES	NETTED

PLAN EFFECTS
E.Q. OBJECTIVES

BENEFICIAL	ADVERSE	NET
PROTECT AND IMPROVE NATURAL BEAUTY OPEN SPACE, WILD & SCENIC RIVERS, WILDERNESS AREAS, ESTUARIES	DESTROY NATURAL BEAUTY	GENERALLY EFFECTS CAN NOT BE NETTED
PRESERVE NATURAL AND CULTURAL SITES AND ECOLOGICAL SYSTEMS	DESTROY NATURAL AND CULTURAL SITES AND ECOLOGICAL SYSTEMS	
IMPROVE QUALITY OF WATER, LAND AND AIR	REDUCE QUALITY OF WATER, LAND AND AIR	
EROSION CONTROL	INCREASED EROSION	
PRESERVE FREEDOM OF CHOICE CONCERNING IRREVERSIBLE EFFECTS	IRREVERSIBLE COMMITMENT PRECLUDING CHOICE OF USE	
UNIQUE OR RARE ARCHEOLOGICAL, HISTORICAL, BIOLOGICAL, OR GEOLOGICAL FEATURE PRESERVATION	DESTRUCTION OF SAME	

1.06

PLAN EFFECTS
RD OBJECTIVE

BENEFICIAL	ADVERSE	NET
INCREASED REGIONAL OUTPUTS	RESOURCES CONTRIBUTED AND PAYMENTS BY REGION	GENERALLY EFFECTS CAN BE NETTED
EXTERNALITIES TO USERS RESIDING IN REGION	EXTERNALITIES TO USERS RESIDING IN REGION	
USE OF UNEMPLOYED RESOURCES IN REGION	LOSS OF ASSISTANCE PAYMENTS FROM OUTSIDE REGION	
ADDITIONAL NET INCOME FROM INDUCED ACTIVITIES	LOSS OF NET INCOME FROM DISPLACED ACTIVITIES	
INCREASED NUMBER AND/OR TYPE OF JOBS	LOSS IN NUMBER AND/OR TYPE OF JOBS	
IMPROVED REGIONAL ECONOMIC STABILITY	ADVERSE EFFECTS ON REGIONAL STABILITY	GENERALLY EFFECTS CANNOT BE NETTED
ENHANCE REGIONAL ENVIRONMENTAL QUALITY AND QUALITY OF LIFE	ADVERSE EFFECTS ON REGIONAL ENVIRONMENTAL QUALITY AND QUALITY OF LIFE	
MOVEMENT TOWARD A DESIRED POPULATION DISTRIBUTION PATTERN	MOVEMENT AWAY FROM A DESIRED POPULATION DISTRIBUTION PATTERN	

PLAN EFFECTS
SOCIAL FACTORS

BENEFICIAL	ADVERSE	NET
INCREASED REAL INCOME OF TARGET GROUP	REDUCED REAL INCOME OF TARGET GROUP	GENERALLY EFFECTS CANNOT BE NETTED
ENHANCE SECURITY, LIFE, HEALTH AND SAFETY	INCREASE HAZARDS TO LIFE, HEALTH AND SAFETY	
CONTRIBUTE TO NATIONAL SECURITY BY PROVIDING RESERVE CAPACITIES OF OUTPUTS AND NATURAL RESOURCES	ADVERSE EFFECTS ON NATIONAL SECURITY	

1 - BENEFICIAL AND ADVERSE EFFECTS ON NATIONAL ECONOMIC DEVELOPMENT 2/

a. BENEFICIAL EFFECTS ON NATIONAL ECONOMIC DEVELOPMENT

National economic development beneficial effects are increases in the value of the output of goods and services and improvements in national economic efficiency resulting from a plan. These include:

(1) The value to users of increased outputs of goods and services; and

(2) The value of output resulting from external economies. 3/

b. ADVERSE EFFECTS ON NATIONAL ECONOMIC DEVELOPMENT

National economic development adverse effects of a plan include:

(1) The value of resources required for a plan; and,

(2) Losses in output resulting from external diseconomies. (See appendix for definitions)

2 - BENEFICIAL AND ADVERSE EFFECTS ON THE ENVIRONMENT

The beneficial and adverse effects of the proposed plan on the environmental characteristics will be evaluated. Environmental effects will be displayed in terms of relevant physical and ecological criteria or dimensions, including the appropriate qualitative aspects. Such an evaluation would include the effects of the proposed plan on:

a. Open and green space, wild and scenic rivers, lakes, beaches, shores, mountains and wilderness areas, estuaries, and other areas of natural beauty;

b. Archeological, historical, biological, and geological resources and ecological system;

c. The quality of water, land and air resources; and,

d. Irreversible commitments of resources to future uses.

3 - BENEFICIAL AND ADVERSE EFFECTS ON REGIONAL DEVELOPMENT

The following beneficial or adverse effects of the proposed plan on local regions will be displayed:

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2/ Water Resources Council Proposed Principles & Standards for Planning Water & Related Land Resources - Federal Register Vol. 36, No. 245, Dec. 21, 1971

3/ See Appendix for Definitions

a. Income effects

(1) Beneficial.

(a) The value of increased outputs of goods and services from a plan to the users residing in the region under consideration;

(b) The value of output to users residing in the region under consideration resulting from external economies;

(c) The value of output in the region under consideration re-sulting from the use of resources otherwise unemployed or underemployed; and,

(d) Additional net income accruing to the region under consideration from the construction or implementation of a plan and from other economic activities induced by operations of a plan.

(2) Adverse.

(a) The value of resources contributed from within the region under consideration to achieve the outputs of a plan;

(b) Payment through taxes, assessments, or reimbursement by the region under consideration for resources contributed to the plan from outside the region;

(c) Losses in output resulting from external diseconomies to users residing the region under consideration:

(d) Loss of assistance payments from sources outside the region to otherwise unemployed or underemployed resources and displaced resources residing in the region under consideration;

(e) Losses in output in the region under consideration resulting from resources displaced and subsequently unemployed; and

(f) Loss of net income in the region under consideration from other economic activities displaced by construction or operation of a plan.

4 - BENEFICIAL AND ADVERSE EFFECTS ON OTHER COMPONENTS OF THE REGIONAL DEVELOPMENT OBJECTIVE.

a. The number and types of jobs resulting from a plan in the region under consideration;

b. Effects of the plan on population distribution within the region under consideration;

c. The effect of the plan on the economic base and economic stability of the region under consideration;

d. The effect of the plan on educational, cultural, and recreational opportunities in the region under consideration;

e. The effect of the plan on the environment in the region under consideration; and

f. The effect of the plan on any other regional development factors.

5 - BENEFICIAL AND ADVERSE EFFECTS ON SOCIAL FACTORS

The beneficial and adverse effects of a proposed plan on social factors will include:

a. Real income distribution. The effects of a plan on the real income of classes or groups that are relevant to the evaluation of a plan will be displayed. All effects, both monetary and income in kind, will be included.

b. Life, health, and safety. Plan effects on life, health, and safety other than those evaluated monetarily for the national economic development objective will be included here. Measurement techniques will vary but would largely by in terms of physical units.

c. Emergency preparedness. The effects of the plan on reserve capacities and flexibilities in resource systems and protection against interruption of the flow of essential goods and services at times of national disaster or critical need will be displayed.

d. Other. The effects on other social factors may be identified and displayed as relevant to alternative plans.

C. Elements of a Good Analysis

The program or project analysis should result in a written presentation that contains all the basic elements of good analysis. It should contain to the extent possible:

1. A clear definition of the problems(s).
2. Identification of the basic public service objectives involved.
3. Selection of "criteria" or "measures of effectives" that will permit comparison of alternatives and estimation of progress against the basic public service objectives. Criteria should not be limited to those that are believed to be quantifiable. Difficult-to-measure factors and "intangibles," if relevant to program selection, should be identified.
4. Identification and description of the key features of the alternative ways to attempting to meet the objectives. Alternatives may be in the form of different programs, different levels of a program, different combinations of programs, etc.
5. Estimates of the full cost implications of each alternative, to include future as well as immediate cost implications.
6. To the extent possible, estimates of full effects, social, economic and ecologic of each alternative. The feasibility of each alternative should also be examined
7. A clear presentation and the "tradeoffs" amont the alternatives considering the costs and effects, as estimated in (5) and (6). Charts graphs, and tables are useful devices.
8. Identification of the major uncertainties, and their quantification, to the extent possible. Uncertainty, often considerable uncertainty, should be expected in any realistic analysis, and the effects on the potential decisions should be estimated.
9. Identification of the major assumptions made in the study, with an indication of the degree to which program choices may be sensitive to them.
10. Documentation of the study to permit others to understand and evaluate what was done in the analysis and indicate how accurate the basic data and the findings can be expected to be.

A program or project analysis may use, if applicable, many of the techniques of mathematics, operations research, economics, the computer studies that are pertinent to the study at hand.

There is not always the time or manpower available to do an in-depth rigorous analysis. However, the 10 features listed should be addressed, to the extent possible, even for a rush, crisis type of analysis.

D. BASIC TYPES OF RESOURCE PLANNING

Basic Difference Between Long-Range Planning and Short-Range Planning or Project Work

An analysis of the effectiveness of various proposed resource management alternatives or combinations of alternatives often involves the estimation

of volumes and values for outputs or commodities which are expected to occur in the future. That is, we must look at time spans (time horizons or time streams) of year by year sequences of resource outputs. These outputs may also vary each year in an expected pattern of flow. Developing suitably reliable quantities and values, or ranges for quantities and values to use in an analysis can be very difficult although not insurmountable.

What this points to is that as we look farther ahead into the future, we also increase the amount of uncertainty involved in resource planning and analysis. Uncertainties will be greater when making long-range plans than it would be for short-range--5 to 30 years as compared with 1 to 3 years. If we allow the various economic factors for different outputs to vary over a range of values and then test them at various points within that range, we can check the sensitivity of the resource alternatives in determining the results of an analysis. This is one of the steps that can be taken to see where and approximately when uncertainty may be critical to resource decisions. It may also indicate to the Resource Manager that he should set the character of his decisions and commitments to include specific restrictions and constraints that allow him the flexibility to adjust his management plans as better information becomes available in the future.

Thus, we see that the time horizon we are dealing with is a key factor in any analysis of resource alternatives.

The minimum time period to consider in the analysis phase of long-range planning should be about 20 years. Plans are often made for a period of 10 years or less, but the analysis used to develop them should cover a longer period. If not, serious problems due to over committing or misallocation of resources will have a high probability of showing up in the next 10-year period. Some of these problems are likely to be of an irreversible nature and cannot be adjusted for any changing management programs, or they will require a very long time period before response is satisfactory.

The question of level of accuracy has an important bearing on the structuring of resource analysis concepts and methods. The key point is that long-range planning is often characterized by elements of great uncertainty, and a high degree of accuracy is not attainable. This being the case, we should not waste effort in trying to attain something which, by the very nature of the problem, is probably not feasible. Furthermore, in most of the more important long-range planning problems, comparisons among a range of alternative future courses of action are of prime interest; and in this comparative type of analysis, the resource impact of the alternatives in a relative sense, is what is more important. Therefore, the orientation of resource analysis concepts and methods should be directed more toward accuracy in a comparative or relative sense, rather than an absolute one. This means use of analytical techniques and analytical guides which allow one to treat alternatives in a consistent and unbiased manner.

PART II - CONSIDERATIONS FOR RESOURCE PLANNING

A. Objective Functions or Statements

The process used to analyse the mix of Resource Management Alternatives or Activities that are applicable to an area of land should include an objective function or statement to guide it. These objective statements may be noneconomic, physically oriented, such as maximizing the amount of recreation produced from an area. Or, they may be oriented towards economic functions. What kinds of objective functions are used depends much upon what the Resource Manager is trying to look at or gain insight into.

Objective functions or statements oriented toward economic aspects of resource planning and analysis include the following:

(1) Minimizing Costs

(2) Maximizing Benefits

(3) Maximizing Net Benefits

Objective functions (1) and (2) when applied to Multiple Use Resource programs or projects tend to lead to results that sub-optimize the total system. A closer realization of total optimization may be achieved by maximizing net benefits. This is the result of maximizing the net difference between the value of benefits minus the value of costs. The effectiveness or utility of this approach depends heavily on the completeness with which costs and benefits are identified and analysed. Particularly, costs other than the money costs. Social costs, induced impacts, opportunity costs, and political costs may need to be reflected in the system. This requires a variety of techniques. Social values may have to operate as constraints or be compared along with relative dollar values in the final analysis and decision making process.

The following is a more detailed explanation of these objective functions:

Minimizing Costs (Least Cost Objective) This is applicable when alternative programs or projects for achieving a given mission or objective have the same level of effectiveness or expected benefits. The alternative with the lowest discounted costs (present worth) should be preferred. This necessitates using a singular clear-cut, fixed objective. This type of objective has several limitations in evaluating multiple resource outputs with varying mixes and scales of development. Usually, we are not analyzing alternative means of achieving an objective that differs only in one or a singular dependent factor or variable. If we were, choosing the cheapest means in this sense would be the only problem. Where the applications of different programs

of inputs result in appreciably different final outputs, the technique becomes even more limited. This is also true where we have greater and more unmeasurable social costs involved, that is, those difficult to quantify in terms of values that are either market or nonmarket values.

Maximizing Benefits as a rule, is the best criterion in cases where benefits are a determining factor in recommending projects where the objective is to favor that program or project which yields the greatest benefits (or effectiveness) for a given level of present worth cost. In situations where it is difficult to project benefits and to compute measures of effectiveness, it is desirable to provide as much useful information as possible to enable a decision to be made as to which alternative yields the most benefits.

Maximizing Net Benefits is the result of maximizing the net difference between the value of the benefits minus the value of costs. The effectiveness or utility of this approach depends heavily on the completeness with costs and benefits are identified and analysed. Particularly, costs other than the money costs. Social costs, induced impacts, opportunity costs, and political costs may be required in the system. Social values may have to operate as constraints or be compared and weighed along with dollar index values in the final analysis and decision making process.

The previous discussion in the Introduction concerning the four major areas of concern, (National Economic Development, Environmental Quality, Regional Development, and Social Factors) is in line with the objective function of maximizing net benefits for those things that can not be valued in a monetary sense as well as those that can.

B. GENERAL PLANNING AND EVALUATION PRINCIPLES

Certain economic assumptions must be made in using the analysis and evaluation procedures because - (1) certain assumptions can simplify the analysis and evaluation; a complex unmanageable problem becomes manageable; (2) the user may stand a good chance of arriving approximately or relatively the same conclusions that more precise information would have led him to; (3) certain types of data may be either scarce, very difficult to obtain or simply unavailable; and (4) most projections have limited reliability as one looks farther into the future, and some types of projects have more uncertainty in them than others.

1. GENERAL SETTING

Full employment will be assumed except where local areas of chronic unemployment, underemployment, or other conditions indicate otherwise. Plan formulation and evaluation should be based on projections

of employment, output, and population and the amounts of goods and services that are likely to be required. Actual or projected needs for water and land resources will be related to these projections. Alternative plans will take into account established standards and goals for the quality of the environment and regional development.

2. MEASUREMENT OF BENEFICIAL AND ADVERSE EFFECTS

Beneficial and adverse effects of each alternative plan will be determined by comparing the conditions expected with the plan to the conditions expected without the plan. Since substantial changes may be expected even in the absence of the plan, care should be taken that this fact is properly reflected in plan formulation and evaluation.

3. PRICE RELATIONSHIPS

When prices are used in evaluation they should reflect the real exchange values expected to prevail over the period of analysis. For this purpose, relative price relationships and the general level of prices prevailing during the planning study will be assumed to hold generally for the future, except where specific studies and considerations indicate otherwise.

4. THE DISCOUNT OR INTEREST RATE

The discount rate is usually established in accordance with the following concept: The opportunity cost of all Federal investment activities, including land and water resource projects, is the real rate of return on non-Federal investments. The best approximation to this rate is the average rate of return on private investment in physical assets, including all specific taxes on capital or the earnings of capital and excluding the rate of general inflation, weighted by the proportion of private investment in each major sector. The basic discount rate used to rank or compare management alternatives is found in two documents--the Office of Management and Budget (OMB) Circular No. A-94 covers all Federal actions except for a few exemptions which are described in A-94. The one exemption which affects Forest Service resource activities are those programs which are formally subject to the Water Resources Principles and Standards. The rate established by the Water Resource Council is usually published in the Federal Register.

5. CONSIDERATION AND COMPARISON OF ALTERNATIVES

A range of possible alternatives to meet needs and problems should be studied. These alternatives should be evaluated or judged as to their relative contributions to the multiobjectives.

Plans, or increments thereto, will not be recommended for development that, although they have beneficial effects on the multiobjectives, would physically or economically preclude alternative non-Federal plans which would likely be undertaken in the absence of the Federal plan and which would more effectively contribute to the multiobjectives when comparably evaluated according to these principles.

6. PERIOD OF ANALYSIS AND TIME STREAMS

The period of analysis will be the lesser of (1) the period of time over which the plan can reasonably be expected to serve a useful purpose considering probable technological trends affecting various alternatives, or (2) the period of time when further discounting of beneficial and adverse effects will have no appreciable effects on design. Appropriate consideration will be given to long-term environmental and social factors which may extend beyond periods significant for analysis of national economic development or regional development benefical and adverse effects.

For any given Resource Use Alternative, there is a year by year schedule of the predicted volume of output or series of outputs and effects that will be produced. There may also be a schedule of installation costs and operation--maintenance costs that would be expected to occur if the alternative were applied. These two types of schedules are called Time Streams. The first is for the expected flow of outputs and effects and the second, for monetary costs. Relative values are developed for each output or effect and then related to the time stream.

Time streams normally terminate at the end of the economic life of the activity or in some cases, its physical life. They may be repeated or recycled if they are part of other activities that have longer time streams.

It is important that all costs and benefits accrue within the same time frame. If the period of analysis (time frame) is 30 years, some of the inputs (costs) and benefits will accrue for a period in excess of 30 years. Since the objective is to match benefits with the cost of producing the benefits, certain adjustments must be made in the data to recognize the benefits and costs likely to occur beyond year 30. The analyst must be alert in recognizing the situations which will require adjustment.

7. SCHEDULING

Plans should be scheduled for implementation in relation to needs so that desired multiobjective beneficial effects are achieved efficiently. Beneficial and adverse effects occurring according to different patterns in time are affected differently by the discount process when plans are scheduled for implementation at

alternative future times. Therefore, plan formulation should analyze the alternative schedules of implementation to identify the schedule that would result in the most desirable mix of contributions to the multiobjectives when the beneficial and adverse effects of a plan are appropriately discounted.

8. RISK AND UNCERTAINTY

Risk is characterized by a distribution of events occurring according to reasonably well-known probabilities, even though their sequence and time of occurrence cannot be determined. Frequency analysis in hydrology, where long records are available or can be mathematically simulated, is an example of predictable risk. In such situations, it may be necessary to choose between planning for average or probable conditions and planning for extreme events. When this is done, the nature of the choice and its relationship to the multiobjectives will be clearly stated. Predictable risk; based upon past experience, should not be divorced from predictable or foreseeable trends which would alter probabilities based solely upon previous experience.

Uncertainty is characterized by the absence of any known probability distribution of events. The nature of uncertainty associated with the planning study, strategies proposed to deal with uncertainty and their impact on the multiobjectives should be reported. In addition, sensitivity analysis may be employed to analyze uncertain situations.

9. SENSITIVITY ANALYSIS

Plans should be examined to determine their sensitivity to data availability and to alternative assumptions as to future economic, demographic, environmental, and technologic trends. Selected alternative projections and assumptions that are reasonably probable and that, if realized, would appreciably affect plan design or scheduling should be analyzed.

10. UPDATING PLANS

Because of rapid change in social, economic, environmental, technologic, physical, and other factors, a plan that is not implemented within a reasonable time after completion should be reviewed to be the best alternative to achieve the multiobjectives.

11. EVALUATION OF CONDITIONS WITHOUT A PLAN

The identification of the specified components of objectives will necessarily involve an appraisal of future economic, environmental

and social conditions expected without the plan as compared with those desired by people for the planning area. In addition, a sufficient inventory and appraisal of the water and land resource base of the planning area will be necessary.

12. FORMULATION OF ALTERNATIVE PLANS

The planning process involves an evaluation of alternative means, including both structural and nonstructural measures, to achieve desired objectives.

Based upon identified needs and problems, alternative plans will be prepared and evaluated in the context of their contributions to the multiobjectives.

The number of alternative plans to be developed for each planning effort will depend upon complementarities or conflicts among specified components of the objectives, resource capabilities, technical possibilities, and the extent to which the design of additional alternative plans can be expected to contribute significantly to the choice of a recommended plan.

Major increments proposed for addition to a plan intended to serve a single objective will be included only if the beneficial effects on that objective of the addition outweight the adverse effects. For example, an increment to an alternative plan proposed for the national economic development objective would be added only if the additional beneficial effects exceeded the additional adverse effects, and similarly for all objectives. For plans emphasizing some combination of objectives, the incremental rule applies to the combination of objectives that is relevant.

13. ANALYSIS OF ALTERNATIVE PLANS

The display of beneficial and adverse effects for each alternative plan will be prepared so that the differences among alternatives can be clearly shown and accurately analyzed. The analysis will provide the rationale for the selection of a recommended plan and the underlying evaluation of the various alternative plans. This analysis will provide the information on which the planning organization and others can base judgments as to the most desirable mix of beneficial effects on objectives as compared with the adverse effects.

The trade-offs among alternative plans should be displayed as fully as possible for the components of all objectives and for effects on social factors to facilitate review and decision.

14. PLAN SELECTION

The recommended plan should be formulated so that beneficial and adverse effects toward objectives reflect, to the best of current understanding and knowledge, the priorities and preference expressed by the public at all levels to be affected by the plan.

In addition to the recommended plan with supporting analysis, other significant alternative plans embodying different priorities among the desired objectives will be presented in the planning report. Included with the presentation of alternative plans will be an analysis of the trade-offs among them. The trade-offs will be set forth in explicit terms, including the basis for choosing the recommended plan from among the alternative plans.

C. RELATIVE RESOURCE VALUE CONCEPTS

1. BENEFITS

The role of the Forest Service as a supplier of the major portion of the public's natural resource related "needs and wants" is guided by the Multiple Use Act prescribed by Congress in 1960. It indicates an objective of maximizing the mix of benefits or the utility of these benefits to the public without impairment of the resources. This is not necessarily a mix of uses that gives the greatest dollar return or greatest units of outputs. It does imply a maximization of social wealth to the public under a multiple use framework that is consistent with the National Environmental Policy Act.

Measurements of revenues returned to the Government generally do not give us a good social and economic indicator of the value or benefit of a resource output or service mix to the public. Nor does it usually reflect the value of the resource. The usual monetary measure of "goodness" or "badness" sought is the net direct benefit of a resource in producing an output or commodity for the public. One of the evaluation criteria related to this is the maximization of present net worth of benefits (outputs). A common denominator used to compare these alternative mixes along with other types of information, is the relative dollar value.

When the benefit values are set up in an analysis, they are normally identified with and related to the specific output or commodity that is produced. That is for a given market area or location, the dollars per unit ($/ton or $/AUM or $/MBF, etc.) will be consistent

for that commodity. Where actual business or competitive market transactions take place, the real dollars exchange will be used to establish an indicator of the relative value or range in value of a resource output. Some of these values may need adjustment because of subsidized prices, costs not directly reflected, or values based on noncompetitive market situations.

For some output categories, a competitive market value for an output may not be readily obtainable. Certain kinds of recreation would be an example of this. In these cases the benefit value can be approximated through the use of several analytical techniques. These techniques, when used in various combinations, will give a reasonable estimate of the relative benefit value of the resource output. While the magnitude or range in magnitude of this value is expressed in monetary terms, the value is not in real dollars because there is no exchange of money.

Most important of all, particularly to the Resource Manager, is the fact that the relative value is only one of several indicators used to reflect the value of the particular resource. Other indicators, such as quality level, uniqueness, amounts, volumes, scarcity, comparative trade-off, opportunity costs, etc. are used with this information to put resource values in a clearer perspective.

2. COSTS

When a combination of management alternatives or activities are evaluated, adequate consideration must be given to the <u>costs</u> (direct cost plus certain opportunity cost). There are several key reasons for this. These include:

a. More than one method or activity may produce the same result or same amount of output--but one may be cheaper than the other. The cost per unit or the impacts from one may be less than the other. Thus, he should know which one is cheaper.

b. To aid in sound, rational decision making, one should know what the total costs of the program or project will be. This includes not only the initial installation costs but also the future expected operation and maintenance costs and terminal costs that will be incurred. This gives insight as to what a particular program or project will require over a period of time--it leads to determining the total cost of the undertaking.

c. For purposes of evaluating the potential effectiveness of various program or project alternatives--<u>total costs</u> regardless of who pays must be estimated and included.

Total costs include all costs--Forest Service, other agencies, nonfederal, and private. For budgeting purposes, Forest Service monetary costs can be identified and tabulated as needed. Where possible, the costs of impacts on other resources, the opportunity costs of the benefits given up or foregone, due to the planned program or project should be determined and included.

The cost data is set up by the specific resource management alternative or activity that generates it. A type conversion activity by dozing would have different costs over time from one that used spraying and controlled burning. The cost data that will need to be identified and set up with the resource management alternatives are:

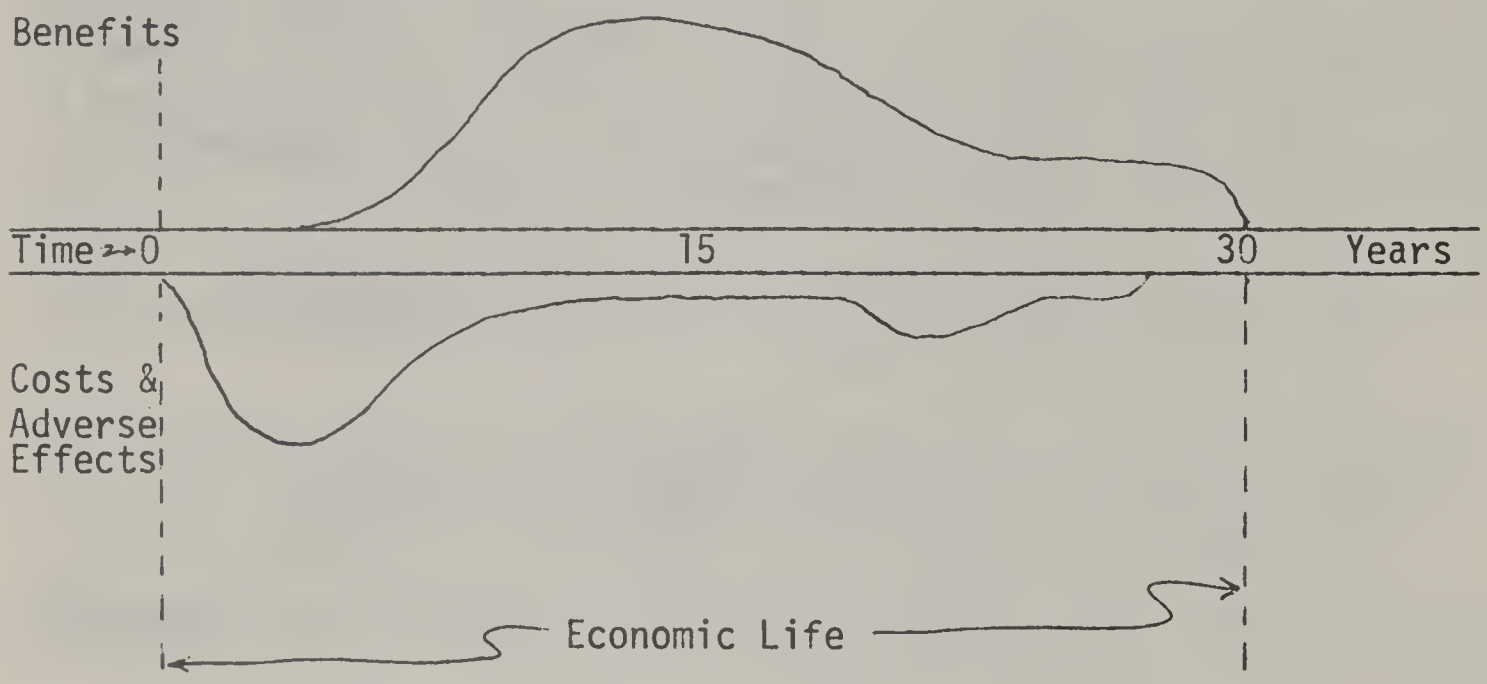
1. Development (planning) and initial installation costs. These are the costs necessary to get the program or project set up and functioning.

2. Basic operation and maintenance costs. These are the costs that will be incurred to keep the program or project going and producing the outputs predicted.

In addition, all of these costs should include the applicable Regional Office and Forest overhead adjustments.

Time Streams

The time stream for a particular project indicates the flow or occurrence of benefits and costs over the life of the project. The series of benefits and costs are shown as they would occur on a year by year basis from the time a project starts until the end of it's economic life.



Time is a vital ingredient in all types of resource analysis. One can not fully describe the beneficial effects and adverse effects of alternatives available to management without indicating when they are likely to occur.

Normally, the period of time horizon used in an analysis covers the time stream for which reasonable approximations of benefits and costs can be meaningfully estimated.

When discounting is used to transform benefits and costs occurring at different times into amounts comparable as of a common point in time (present value), the time stream should include those years where the benefits and costs after discounting meaningfully contribute to the present value calculation.

COSTS

Applying Cost Index Values to Resource Activities

Earlier sections have pointed out that costs are associated with specific resource activities and that there are generally two basic kinds of costs. (1) Initial Costs and (2) Operation and Maintenance Costs. These costs are further divided as follows: (A complete description of the various costs are included in the Appendix of Definitions).

Development and Initial Installation Costs

1. Research and Development
2. Initial Investment Costs
3. Associated Costs

Operation and Maintenance Costs

1. Personnel
2. Annual Operating Costs-Includes materials, supplies, utilities, transportation, and other services.
3. Maintenance and Repair
4. Associated Costs

Perhaps the more important fact to remember is to be able to recognize a benefit or a cost, identify it as to whether it is direct or non-direct, and get it into the system with the appropriate time stream. Except where specifically stated for a certain type of analysis, non-direct (secondary) benefits will not be included in the benefit time streams.

Cost Categories

Most costs can be transformed into a cost per acre basis. These categories of costs have variable units of expression in that the cost per unit can be associated with a given or set number of units per acre. Certain logging costs vary with the volume of timber and must reflect the volume per acre cut. A few exceptions, such as roads, may be set up on a cost per mile basis.

When the costs are a fixed unit nature, such as a dam or other type of major installation, transformation of costs to a constant per acre basis is not practical or meaningful to the analysis. To handle this, the dam is made an activity by itself. The unit of cost used is the dam, and the fixed unit costs are in dollars per dam per year, rather than per acre or other units.

Sources of Cost Data

Local cost data from the district or the Forest should be used when available. Recent, past, or ongoing projects may be useful sources. Adjacent Forests or Regional Office cost data can be adjusted and used if local data is inadequate or not available. Special in-Service reports and studies, or similar work done by other Federal and State agencies may be helpful. Certain costs, such as those associated with sedimentation and wood fibre activities have specific cost guides to apply in a similar manner as is done with the benefit index values for recreation.

PART III - RELATIVE RESOURCE VALUES - BENEFITS & COSTS

This section and its subsections provides detailed procedures and guides for deriving benefit values for various resource outputs (commodities) and cost values for various resource management alternatives that produce these commodities or outputs.

1. RECREATION-WILDLIFE-FISHERIES VALUE GUIDES

A - Basic Procedures

Relative Values can be derived from a series of value guides for cases where value data does not exist or time does not allow special studies and analysis to be made.

The value guides are set up as follows:

1. General Recreation Value Guide
2. Specialized Recreation Value Guide
3. Hunting - Specialized Value Guide
4. Fishing - Specialized Value Guide

It is important that the user of these guides understands the difference between general and specialized recreation so that he can pick the appropriate guide or guides. A section that follows will explain this difference. Another important area is the converting of Recreation Day values to Forest Service Visitor Day values. Either one may be used but consistency between units of value and use must be maintained. As long as the user is consistent, the total benefit index value of the outputs will be the same. A section is also set up to illustrate the process used to make these adjustments.

Differentiating Between General and Specialized Benefit Values

In 1964, Senate Document 97, Supplement No. 1 established a range of values to be used for general and specialized recreation uses in the evaluation of water resource development projects. It is suggested that these figures updated in July 1970 by the President's Special Task Force on both water and land resource planning, be used as the base proxy market values until better empirical estimates are available.

The Supplement No. 1 schedule of values and description of the activities involved follows:

Type of Outdoor Recreation Day	Range of Unit Day Values
General . . . 1972 Value Level 1/	$0.75 - $2.25

Those activities attracting the majority of outdoor recreationists and which, in general, require the development and maintenance of convenient access and adequate facilities. This category

1/The 1963 price levels of Supplement No. 1 were superseded by the December 1971 Federal Register announcement by the Water Resources Council, Standards for Planning Water and Land Resources, Part II.

includes, but is not limited to, most warm water fishing, swimming, picnicking, hiking, sightseeing, most small game hunting, nature studies (except nature photography), tent and trailer camping, maring pier and party boat fishing, water skiing, scuba diving, motor boating, sailing, and canoeing in placid waters.

Type of Outdoor Recreation Day	Range of Unit Day Values
Specialized. . .1972 Value Levels	$3.00 - $9.00

Those activities for which opportunities, in general, are limited, intensity of use is low, and which often may involve a large personal expense by the user. This category includes, but is not limited to, cold water fishing and for resident and migratory species, upland bird and waterfowl hunting, specialized nature photography, big game hunting, wilderness pack trips, white water boating and canoeing, and long-range cruisers in areas of outstanding scenic environment.

Supplement No. 1 defines a recreation day, as used above, as "a standard unit of use consisting of a visit by one individual to a recreation development or area for recreation purposes during any reasonable portion or all of a 24-hour period." Note that this unit corresponds roughly with what is termed a recreation visit. The values will need to be converted to a visitor day basis before being used in any analysis that deals with visitor days. As an example, assume that, for a picnicking site in question, recreation visits average four hours in length. Since a standard visitor day is twelve hours, a visitor day at the site will involve three recreation days. If, from Chart I in the General Recreation Guide, the site has a point value of 50, each recreation day is then valued at $1.50. The value of a visitor day is equal to the recreation day value times the conversion factor (3X) or $4.50.

The Pacific Southwest Inter-Agency Committee has developed a methodology for determining general recreation values in a consistent manner under Supplement No. 1. This involves a system of scoring various criteria by judgment factors to arrive at a total point score for recreation of a given site. Based on the total points, the value per recreation day is determined within the spread listed on charts for general recreation activities. These charts are included in this guide. The dollar recreation benefits shown in Chart II have been adjusted.

A similar chart for specialized recreation activities will be developed in the future. When it is completed, it will be sent out as a supplement. In the meantime, we suggest that users interpolate within the range of specialized recreation values as appears rational.

Alternative

If the user of these aids to analysis would prefer not to use explicit proxy market values for recreation, there should at least be an attempt made to identify the indirect (implicit) values attributed to recreation in the analysis. This can be done by calculating the opportunity costs that result from the emphasis given to recreation in a decision. These opportunity costs include the value of such things as timer production, grazing, and water foregone in order to provide for the chosen amount of recreation, wildlife, and esthetic uses. The values foregone must be net of any costs that would have had to be incurred in order to produce the outputs.

These opportunity costs represent a minimum vlaue that the decision maker is placing on recreation when he makes his decision. The true value may be higher than this minimum, but the decision maker is saying that the recreation values are at least this high. This is, in effect, the direct price the public is paying for the recreation.

Applying the Benefit Value Guides

The problem of valuing outdoor recreation has been plaguing resource managers for many years. The issue is still largely unresolved, although economists and resource analysts are now devoting a considerable amount of attention to it. In using the benefit value guides in this system, it is important that the analyst remember that he is trying to approximate what recreation users would be willing to pay and not his own value scheme. The suggestions are intended to provide an "expert opinion" judgment to be used when better information is not available. The major value is to provide a consistent approach to recreation values.

Outdoor recreation uses are frequently described as non-market goods since they are generally provided to the user either free or at a cost substantially below what their full value is assumed to be. This makes these uses very difficult to give a proper weight in analyses that involve other uses that are of a market nature. To fail to give recreation uses an explicit weight can result in an erratic influence on the conclusions of a given analysis, ranging from no influence at all to a major, but unsupported influence. Neither extreme is warranted or desirable. These values are substitutes for whatever a true market value would be, if one could be determined. Since these values are, at best, only an approximation of what true market values might be; two or more levels of proxy values should be used if time permits. By so doing, the sensitivity of the analysis to low and higher values for recreation can be tested.

The Basic steps used to apply the four different benefit index value guides are outlined and illustrated as follows:

General Recreation Value Guide

Step 1. A benefit index value using the General Recreation Guide is calculated by totaling the applicable point values for each of the criteria in Chart I for points A, B, C, etc.

Step 2. Within each group there are a range of values, each with a set of criteria. The benefit value with the criteria that most applies to the type of recreation being described is the value to use.

Step 3. The benefit value is then converted from recreation days to Forest Service visitor days value, if needed, by applying the conversion procedure discussed in earlier sections. See Example 1, Table -6, A Step-by-Step Derivation of visitor Day Benefit Index Rates.

Specialized Value Guides

Step 1. A benefit value using the Specialized Recreation Guide is calculated by first locating the correct grouping for the the type of recreation, I - Reservoir trout, II Warm water stream, etc.

Step 2. Within each group there are a range of values, each with a set of criteria. The benefit value with the criteria that most applies to the type of recreation being described, is the value to use.

Step 3. The benefit value is then converted from recreation days to the Forest Service visitor days value, if needed, by applying the conversion procedure discussed in sections that follow. See Example 1, Table -6, A Step-by-Step Derivation Visitor Day Benefit Values.

Specialized Value Guides

The criteria in the guides which follow have been adoped by the Department of Fish and Game and Water Resources for use in water project planning studies.1/ The values which are assigned to various activities will be modified as the technical capability in this field develops and as additional data are available. Until more satisfactory techniques are developed, these values and criteria are to be used for benefit evaluations in connection with resource planning and project work.

The application of these recreation values can be grouped into two major purposes. These are:

1. To show the value of existing, additional, or new fish and wildlife; and to make relative comparisons between alternatives and tradeoffs.

1/Adapted from Senate Document 97, Supplement No. 1, and California Fish and Game Department. Updated and revised Dec. 1971, by the Special Task Force Report to the President and W.R.C. on Standards for Planning Water and Land Resources, Part II. See Economic Concepts section in the appendix.

2. To show the relative value of change in improved habitat quality and the resulting change in fisheries and wildlife quality. This quality change may or may not be accompanied by an increase in the species population or amount of utilization. The opposite of this situation, caused by adverse impacts on habitat can also be evaluated to determine the magnitude of tradeoffs.

B - Use of General Recreation Guide

Each type of recreation output should be carefully checked to see whether it fits into the General or the Specialized category--(see previous sections). In addition, it is important to recognize that each item must be viewed in terms of its relationship to the area or region it is expected to occur in. This requires consideration of the existing recreation and existing demand level, and potential recreation capacity and future predicted demand levels. These future demand levels should also reflect this influence of surrounding areas that compete for the same activities because they will affect the demand of sites that are within these influences. Those types of activities that have high demand but are relatively abundant in a particular area may warrant a lower benefit index value than the same activity of the same quality but in an area where it is relatively scarce in comparison to the demand for it.

For example, a water-oriented recreation in one subregion that has relatively abundant streams and lakes or reservoirs might have a lower value than an adjacent subregion with relatively high population and recreation demand, but a scarcity of high quality water recreation areas.

From a resource economics sense, the recreation described in the first subregion or area is in the general recreation class, but the same kind of recreation in the other area or subregion could qualify as a more specialized or higher valued recreation output. These types of adjustments should be done after thorough and careful analysis indicates a substantiated need.

TABLE - 6

A Step-By-Step Example Derivation of Visitor Day Benefit Value - Using Recreation Value Guides

Step-by-Step Procedure	(1)	(2)	(3)	(4)=(2)(3)	(5)	(6)=(4)(5)
Output or Commodity	CHART I Total Added Point Value or Ranking Index Number 1/	Initial Calculated Value/RD 3/	RD to VD Value Conversion Factor 4/	Preliminary Value/VD	Percent Use Mix Factor 5/	Benefit Value per Visitor Day Subtotal / Total
Picnicking - GR General Recreation	A-4+B-6+C-4+ D-4+E-6+F-6 =(30)	$1.50(0.30 pts) + $0.75 = $1.20 (See footnote on exact values at bottom of Chart II)	3.0	$3.60	1.0	$3.60
Camping 2/ 30% General - GR 70% Fishing - SR	General A-7+B-6+C-8+D-6 +E-8+F-6=(40)	$1.50x(0.40) +$0.75 = $1.35	0.7	$0.94	0.30	$0.28
Specialized Recreation	(A3)=$3.60 Special	$3.60	1.5	$5.40	0.70	$3.78 / $4.06
Fishing - SR (Reservoir warm water)	(A3) = $3.60	$3.60	1.5	$5.40	1.0	$5.40
Fishing - SR (Stream cold water)	(B3) = $4.20	$4.20	1.5	$6.30	1.0	$6.30
Water Fowl Hunting - SR	(A2) = $6.00	$6.00	1.5	$9.00	1.0	$9.00

1/ Point Values or Ranking Index based on General Recreation and Specialized Recreation Value Guides Points A,B,C,D and E taken from General Recreation Value Guide. Ranking indexes A1, A2, A3, B1, B2, B3 by type and activity are taken from the Specialized Recreation Value Guide.

2/ Primary purpose of camping in area is to go fishing rather than general camping. Method No. 1 was used to develop composite benefit value index.

3/ Value can be calculated by using (1) total points times index value or (2) from the direct relationship between ranking index and index value depending on whether the activity is General or Specialized recreation.

4/ Taken from Table .-7 General Pacific S.W. Conversion Factors for Recreation and other Related Commodities, or Outputs, or calculated for local conditions.

5/ These normally have a 1.0 value unless it is a mixed activity being described and valued.

6/ This value could vary over time if resource use and availability projections indicated changes in supply and demand that would create a new relationship.

GR = General Recreation Guide derived value.
SR = Special Recreation Guide derived value.

CHART I GUIDELINES FOR EVALUATING ALL GENERAL RECREATION - (Assuming Ultimate Development)

	JUDGMENT FACTORS				
A) Available alternate areas or sites.	Several within 1.5 hr. travel time; a few within 30 min. travel time.	Several within 1.5 hr. travel time; none within 30 min. travel time.	One or two within 1.5 hr. travel time; none within 45 min. travel time.	None within 2 hr. travel time.	None within 2.5 hrs. travel time.
Point Value:	0-3	4-6	7-10	11-14	15-16
Total Points: 16					
B) Access to the area	Limited access by any means to project and within project (4 wheel drive or packing)	Fair access, poor quality roads (auto only) to project; limited vehicle access (4 wheel drive) within project	Fair access, fair roads to project; fair access, poor quality roads within project (auto only, no trailer)	Good access, good roads to (car with trailer); fair access, good roads within project	Good access, high standard road to project; good access, good roads within project
Point Value:	0-3	4-6	7-10	11-14	15-16
Total Points: 16					
C) Facilities that add enjoyment, convenience and comfort.	No facility development - Level I	Minor facility development - Level II	1 or more areas of adequate quality facilities - sanitation, grills, parking - Level III	1 or more areas of high quality facilities - Level IV	High quality facilities in all areas - Intensive and extensive development - Level V
Point Value:	0-2	3-5	6-8	9-11	12-14
Total Points: 14					
D) Activities to particpate in[1] (Diversity and Number)	One or two general activities No activities of outstanding character[2]	One or two activities with at least one of outstanding, stimulating or satisfying in character	Several general activities. Or one activity that is outstanding or very stimulating or very satisfying character	Several general activities; with one or two of outstanding, stimulating or satisfying in character.	Several general activities; most of them are of outstanding or stimulating in character
Point Value	0-2	3-5	6-8	9-12	13-16
Total Points: 16					

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	JUDGMENT FACTORS				
E) Esthetics Basic Environmental Elements: Vegetation Geology Water Climate Wildlife and Fisheries	Surrounding landscape lacks diversity, no unique or unusual features present, the basic elements present, have little or no variety. Two or more elements may be lacking. Near views, far views, or vistas are confusing or lacking	Surrounding landscape has some diversity but lacks uniqueness. Occasional contrasts of color and variety are present in the surrounding geology, vegetation, and water environment. One or two major environmental elements are lacking.	Surrounding landscape has three or more basic elements present. Strong contrasts or diversity in color and variety in at least two of the basic elements or one element has unique or outstanding characteristics. Diverse near views or far views are present as well as vistas	Surrounding lanscape has at least three or more basic elements present. Much diversity and contrast is present. One or more unique areas exist and there are some outstanding near views, far views or vistas.	Surrounding landscape has at least three or more basic features present. Unique area or areas are outstanding. Color contrast and diversity is abundant. Near views and/or far views are all outstanding.
Point Value:	0-3	4-6	7-10	11-14	15-18
Total Points: 18					

3.09

F) Environmental Quality3/	Area or site shows marked deterioration, degradation, or have a natural lack of quality in 2 or 3 of the basic environmental elements present. Two or more severe cases of the following are present: Drastic modifications of original landscape, accelerated land instability, severe erosion or sedimentation, site deteriation,	Area or site shows definate evidence of <u>approaching or nearing</u> a more advanced stage of deterioration or degradation in quality for two or more of the basic environmental elements present. The lack of some element may detract from the area or site. A few isolated examples of severe degradation	Area or site shows a few scattered or occassional signs of minor or very early stages of deterioration or degradation of at least one of the basic environmental elements present. Quality of the existing elements are relatively average with no more than one element of high or unusual. quality.	Area or site shows no or only a small isolated case of minor deterioration or degradation of one of the basic environmental elements present. Most or all of the basic elements are present and in relatively highquality.	Area or site is of outstanding quality in all the environmental elements present. No degration or deterioration exists.

(Part F cont'd next page)

CHART I GUIDELINES FOR EVALUATING GENERAL RECREATION (CONT'D)

JUDGMENT FACTORS				
	objectionalbe or or detracting or unsightly exposures, objects, or conditions on the area or in the landscape, physical, chemcal or biological pollution of water. Water levels relatively unstable during use periods. Climatic factors including temperature, air, winds, etc. have objectional variations one unstable, distract from the area or are polluted. Fish and wildlife habitat and/or populations severely depleted, habitat eliminated, or low in potentials.	or deterioration are evident. Water related elements may show undesirable variation or instability. Area or site appears to be declining in overall quality. A few unsightly or objectional objects or conditions can be found or are occationally noticed in the area. Water and climatic pollution is evident at a distracting or objectionable level.		Site potentials may be high and the area is capable of maintaining or restoring itself under existing pressures and utilization.
Point Value:	0-3	4-6	7-11	12-16	17-20
Total Points: 20					

1/ General activities include those which are common to the region and which are usually of normal quality. This includes picnicking, camping, hiking, riding, cycling, fishing, and hunting which would be normal quality. Also included are scientific-geological-historical areas of local significance.

2/ High value activities include those which are not common to the region and/or nation and which are usually of high quality. This includes high quality bathing and boating and aesthetic-scientific-historical-geological areas of national significance.

3/ Some factors to be considered in lowering quality include air and water pollution (include odors and noises), pests, poor climate and unsightly adjacent areas.

CHART II GUIDELINE VALUE CONVERSION CHART FOR EVALUATING ALL GENERAL RECREATION 1/

Value Range $0.75 - $2.25 per Recreation Day

Total Point Value	0	10	20	30	40	50	60	70	80	90	100
Recreation Benefit Value - $/RD 2/	0.75 Base	.90	1.05	1.20	1.35	1.50	1.65	1.80	1.95	2.10	2.25

Approximate Value by Direct Reading

Example: If from Chart I - General Recreation Guide, point factors A + B + C + D + E + F = 60 points then the Benefit Value can be read directly as $1.65/RD.

Exact Value by Interpolation

Example: Value of the basic point spread ranges from a base of $0.75 to a high of $2.25 = $1.50 value range. If from Chart I - General Recreation Guide, point factors A + B + C + D + E + F = 65 points, then: Recreation Day Benefit Value = Value Range x Total Point Value + the base value = Minimum Benefit Index Value = ($1.50) (0.65) + $0.75 Base = $1.72

1/ Points between values should be interpolated

2/ These values must be converted to $/VD to be used with U. S. Forest Service visitor days. As long as consistent units are used, the total value is the same.

C - Specialized Recreation, Wildlife and Fisheries

(1) Category - Nature Photography and Wildlife Observation

Type A - Nature Photography

Value range of $3.60 - 7.00 per recreation day.

Class & Value/RD

A1 - $3.60 - A small number of species of wildlife are present; environment supports only small numbers of each species and has few outstanding plant species. The surrounding area is no more than average in overall environmental quality.

A2 - $5.00 - The area possesses either a great number of species or a great number of one species or has an outstanding plant flora. The general environment is above average or has one feature outstanding in quality.

A3 - $7.00 - The area possesses two of three characteristics: a large number of animals of each species and an outstanding plant flora or a rare species or endangered species. Overall esthetics and environment of the landscape is outstanding.

Type B - Wildlife Observation

Value ramge pf $3.60 - 7.00 per recreation day.

Class & Value/RD

B1 - $3.60 - A small number of common wildlife species are present. Overall environmental setting of the area is not above average. No outstanding esthetic or scenic features are present.

B2 - $5.00 - The area has a large number of species present or a large number of a particular species. Total environmental setting of habitat and surrounding landscape is above average. An outstanding scenic or esthetic feature may be present.

B3 - $7.00 - The area has a number of unique or rare species present. The quality of surrounding habitat and overall environment is outstanding. A rare endangered species may be present. The area may also have several outstanding scenic or esthetic features.

(2) Category - Winter Sports

Type A - Snowmobile Touring

Value range of $3.50 - 6.00 per recreation day. Note that some local market values may exist.

Class & Value/RD

A1 - $3.50 - Snowmobiling over short distances or relatively short periods of time. General scenery and esthetics of the travel route is not outstanding.

A2 - $4.50 - Longer extended trips through areas or above average scenery and esthetics. Area more removed from general winter road traffic.

A3 - $6.00 - Full day trips or extended travel through areas of outstanding scenic beauty or esthetics. Little or no awareness of winter road traffic. Overall environmental setting is outstanding.

Type B - Skiing & Snowshoeing

Value range of $3.50 - 9.00 per recreation day.

Class & Value/RD

B1 - $4.00 - General cross-country skiing or snowshoeing. Surrounding landscape is average or better in terms of winter scenery and esthetics. Some awareness of rural population and vehicular traffic.

B2 - $6.00 - Same as (B1) above, but areas are outstanding or spectacular in scenic features. No awareness or evidence of rural population. Surrounding environment is quite natural and uninterrupted.

B3 - $4.50 - Downhill skiing with a variety of lift facilities. Shelter and sanitation provided at the site. Variety of ski runs available. Surrounding landscape is scenic but not outstanding.

B4 - $6.00 - Wide variety of lifts and runs available. Facilities--parking, lodges, sanitation--are relatively adequate. Surrounding landscape and overall setting is above average in scenic quality but not outstanding.

1/ Where lift or tow ticket fees are charged, then these vaues are real market values and should be used. The proportion of half day and full recreation day tickets should be used to properly weight the market value that is used as the benefit value.

B5 - $9.00 - Same as (B4) above but the total environment of the area is of high quality. Esthetics and scenery of the surrounding area has one or more outstanding features.

(3) Category - Backpacking Experiences

Type A - Backpacking

Value range of $5.00 - 7.00 per recreation day.

Class & Value/RD

A1 - $5.50 - Backpacking into remote or primitive areas. Scenic or esthetic features of the surrounding area are above average or have one or more outstanding features. Overall environmental quality of the area is outstanding.

A2 - $7.00 - Backpacking into wilderness or outstanding primitive areas. Rare or unusual esthetic features exist in the area. Surrounding landscape may have interesting ecologic communities. Overall environmental setting is outstanding.

(4) Category - White Water Boating and Canoeing

Type A - White Water Boating & Rafting

Value rangy of $5.50 - 7.00 per recreation day.

Class & Value/RD

A1 - $5.50 - Boating and rafting through river reaches of high scenic or esthetic quality. Some reaches are outstanding whether they are placid waters or sections of rapids and white water. Overall environmental quality is high.

A2 - $7.00 - Boating and rafting through areas of wild and scenic rivers that contain placid reaches of unusual scenery or outstanding esthetics. Or, there are reaches of white water and rapids that are outstanding in character and scenic beauty. Overall environmental surrounding is high or outstanding.

Type B - Canoeing

Value range of $5.00 - 7.00 per recreation day.

B1 - $5.00 - Canoeing through river reaches of high scenic or esthetic quality. Some reaches are outstanding whether they are placid waters or sections of rapids and white water. Overall environmental quality is high.

B2 - $6.00 - Canoeing through wild and scenic rivers. Reaches may be either placid or white water in character and are esthetically and environmentally of high or ourtstanding quality.

B3 - $7.00 - Canoeing through lakes and rivers in wilderness or primitive areas. Esthetic and ecologic features of the surrounding areas are outstanding, rare, or unusual. Overall environment is outstanding.

(5) Category - Trout Fisheries 1/

Type A - Reservoir Trout Fishing

Value range of $2.50 - 4.50 per recreation day.

Reservoir trout angling shall be considere specialized recreation and evaluated under the following guidelines whenever catchable trout are planted or whenever trout angling constitutes 25% or more of the total visitor use (if less than 25% the use will be considered as general recreation and values will be suggested by the General Recreation Guide.)

Class & Value/RD

A1 - $2.50 or the general recreation benefit value if greater than $2.50 - Average catch per recreation day of 1/2 lb. or less including "fishing for fun" only waters; the average fish caught is not outstanding (an outstanding trout is defined as an uncommon species such as golden trout or trout over 1/2 lb.). The reservoir surface contains very few if any esthetic qualities and the environment of the surrounding landscape has few or no scenic features.

A2 - $3.25 - Average catch per recreation day is above 1/2 lb. or more; the average fish caught is not outstanding.

1/ No differentiation is made between the common species of trout (rainbow, brown and brook) and kokanee, whitefish and catchable-size stocked trout.

The esthetics of the reservoir surface may have some above average characteristics and there may be an occasional outstanding environmental features in the surrounding landscape.

A3 - $4.50 - Average catch per recreatio day is over 1/2 lb.; the average fish caught is outstanding. The esthetics of the reservoir surface and the environmental quality of the surrounding lansscape is outstanding.

Type B - Stream and River Trout 2/

Value Range of $3.50 - 5.75 per recreation day.

Class & Value/RD

B1 - $3.50 - Average catch per recreation day of 1/2 lb. or less including "fishing for fun" only waters; bare minimum facilities are provided at roadside waters; or the average fish caught is not outstanding; the stream area possesses little scenic or esthetic attraction.

B2 - $3.75 - Average catch per recreation day of about 1/2 lb. or more; good quality facilities are provided at roadside waters and good rustic facilities are provided at remote waters; or the average fish caught is not outstanding; the stream esthetics and the environment of the surrounding landscape do possess some above average qualities.

B3 - $4.75 - Average catch per recreation day of about 3/r lb.; good quality facilities provided; or the average fish caught is outstanding; and, or the stream does possess some outstanding esthetic values. The environment of the surrounding landscape may have some features of higher quality.

B4 - $5.75 - Average or above average catch per day of 1 and 1/2 lbs. or more. Average fish is outstanding. The esthetics and environment of the stream and adjacent landscape are outstanding.

(6) Category - Warm Water Fisheries 3/

Type A - General Warm Water Fishing

Value range of $2.00 - 3.75 per recreation day.

2/ Excludes steelhead fishing.
3/ Reservoirs, rivers, and canals, and excludes striped bass and American shad.

Class & Value/RD

A1 - $2.00 - Average catch per recreation day of about 1/2 lb.; minimum facilities provided; the average fish caught is not outstanding (an outstanding warm water fish is defined as a fish over 1 lb.); the stream area does not possess any outstanding scenic or wildlife values.

A2 - $2.75 - Average catch per recreation day is about 3/4 lb.; good quality facilities are provided; or the average fish caught is not outstanding; the stream area does possess some outstanding scenic or wildlife values.

A3 - $3.75 - Ther average catch per recreation day is over 1 lb.; good quality facilities are provided; or the average fish caught is outstanding; the stream area does possess several outstanding scenic or wildlife values.

(7) Category - Bass and American Shad Fisheries

Type A - Striped Bass Fishing 4/

Value range of $4.50 - 6.00 per recreation day.

Class & Value/RD

A1 - $4.50 - Average catch per recreation day is about 0.25 fish; access and some sanitary facilities are provided; includes bank and skiff fishing in the ocean, bays, rivers, canals, and reservoirs. Fishing area has a few esthetic qualities or is about average at best.

A2 - $5.15 - Average catch per recreation day is about 0.50 fish; access and sanitary facilities are provided; includes skiff fishing in the bays and reservoirs. Fishing area or adjacent landscape possesses some above-average esthetic features. Total environmental setting is above average.

A3 - $6.00 - Average catch per recreation day is about 1.00 fish or more; good quality facilites are provided; includes party boat fishing in the ocean and bays. Fishing area or adjacent surrounding landscape has outstanding esthetic features and the overall environmental quality of the area is high.

4/ Includes ocean, river, canal, and reservoir fishing.

Type B - American Shad Fishing

Value range of $2.50 - 3.75 per recreation day.

Class & Value/RD

B1 - $2.50 - Average catch (including fish returned alive to the water) per recreation day of 1 - 3 fish; facilities provided for access and some sanitation. Fishing area has few esthetic qualities or is average at best. The environmental quality of the surrounding landscape is average or less.

B2 - $3.15 - Average catch per recreation day of 4 - 9 fish; rod-and-reel fishing from shore or wading; facilities provided for access and sanitation. The surrounding area may have some above average esthetic features and the overall environmental setting is above average but not outstanding.

B3 - $3.75 - Average catch per recreation day of 10 fish or more; rod-and-reel and dip net fishing; facilities provided for access and sanitation. The esthetics of the area and the environmental quality of the surrounding landscape is outstandig.

(8) Category - Anadromous Fisheries

Type A - Salmon Sport Fisheries - Ocean

Value range of $7.00 - 20.00 per recreation day.

Class & Value/RD

A1 - $7.00 - Per rejreation day; own boat and gear furnished.

A2 - $14.00 - Commercial sporting boat used. No gear furnished. 5/

A3 - $16.00 - 20.00 - Boat and all gear furnished. 5/

Type B - Salmon Sport Fisheries - Rivers and Streams

Value range of $4.50 - 7.00 per recreation day.

Class & Value/RD

B1 - $4.50 - Average catch per recreation day of about 0.10 fish; facilites may be provided for access and sanitation.

5/ These are actual market fees charged, linceses excluded, the sport fisherman for 6 to 8 hours of salmon fishing.

Stream esthetics and surrounding landscape environment may be of less than average quality and no outstanding features are present.

B2 - $5.75 - Average catch per recreation day of about 0.20 fish; facilites provided for access and sanitation. Stream esthetics and environment of surrounding landscape are average or above average in quality but not outstanding.

B3 - $7.00 - Average catch per recreation day of about 0.40 fish or better; facilites provided for access and sanitation. Stream esthetics and environment of surrounding landscape are outstanding or of high quality.

Type C - Salmon - Commercial Fisheries

Value range of $0.45 - 0.65 per pound net value.

Class & Value/LB

C1 - $0.45 - Medium is large boats with high fixed costs and major dependence on fisheries.

C2 - $0.65 - Smaller boats with lower fixed costs and income source not primarily dependent on fisheries.

Type D - Steelhead Fisheries

Value Range of $4.75 - $6.75

Class & Value/RD

D1 - $4.75 - Average catch per recreation day of about 0.10 fish; facilities may be provided for access and sanitation. Stream esthetics and surrounding landscape are often of less than average quality and no outstanding features are present on the surrounding landscape.

D2 - $5.75 - Average catch per recreation day of about 0.20 fish; facilites provided for access and sanitation. Streamside esthetic quality and the environment of the surrounding landscape are above average and may have some outstanding features.

D3 - $6.75 - Average catch per recreation day of about 0.40 fish or better; faciliteis provided for access and sanitation. Streamside esthetics and environmental features of surrounding landscape are outstanding.

(9) Category - Game Animals

Type A - Small Game

Value range of $3.50 - $6.00 per recreation day.

Class & Value/RD

A1 - $3.50 - Includes rabbits, gophers, squirrels, etc. Hunting success of 25% to 50% of limit. Surrounding environment for that type of hunting is less than or no greater than average. No outstanding esthetic features are present on the landscape.

A2 - $4.25 - Includes same as (A1) above, but the setting of the hunding area is above average in overall environmental quality. Some outstanding esthetic features may be present. Of, success ratio may be 50% or greater.

A3 - $5.00 - Includes coyotes, bobcats, foxes, lynx, etc. Hunting success of 25% to 50% of limit. Surrounding environment for that type of hunting is less than or no greater than average.

A4 - $6.00 - Includes same as (A3) above, but the setting of the hunting area is average or better in overall environmental quality. Some outstanding scenic or esthetic features may also be present on the surrounding landscape. Or, success ratios may be 50% or greater.

Type B - Big Game

Value range of $5.00 - $9.00 per recreation day.

Class & Value/RD

B1 - $5.50 - Includes deer and antelope. Area hunting success of 25% to 50%. Overall hunting environment of the area is not more than average for that type of hunting. No outstanding esthetic features are present.

B2 - $7.00 - Includes deer and antelope. Area hunting success may be 50% or greater. Or, surrounding hunting area is average or better in overall environmental quality. Some outstanding scenic features may be present in the area.

B3 - $7.00 - Includes elk, moose, wild goat, bear, mountain lion, and wild pig. Hunting success in are area ranges from 25% to 50%. The overall quality of environment for the general area is not more than average for that type of hunting.

B4 - $9.00 - Includes all game in (A3) but the hunting success is 50% or greater. Or, the area is much above average in esthetic and scenic features. The overall environmental quality of the surrounding area is high.

(10) Category - Game Birds

Type A - Waterfowl

Value range of $5.00 - 7.00 per recreation day.

Class & Value/RD

A1 - $5.00 - Small pond or river shooting with a success rate of about one bird per recreation day or less.

A2 - $6.00 - Marshes where the success rate approximates two birds per recreation day; for example, most State shooting areas. Includes small ponds and river shooting also with a higher success rate.

A3 - $7.00 - Marshes where the success rate approximates 3.0 birds or more per recreation day; or, hunting environment is outstanding in quality. Natural cover for blinds are present or permanent blinds provided. Includes wheat fields, corn fields, and other cover complexes where bids congregate and hunter success is relatively good.

Type B - Upland Birds

Value range $4.50 - 6.00 per recreation day.

Class & Value/RD

B1 - $4.50 - Includes pheasants, quail, grouse, chukar, and doves. Average success of about 50% or less of limit per day. Areas hunted are average or below average in landscape variety, esthetic and environmental quality.

B2 - $6.00 - Includes all in (A1) above. Average success of more than 50% of limit per day. General esthetic and environmental character of areas hunted are above average or has some outstanding qualities.

D - RECREATION VALUE CONVERSION FACTORS

Conversion Principles

Conversion factors for changing recreation days to visitor days and visa versa are needed because of different reporting methods between agencies. Several methods of handling this situation are possible and illustrations are given. In the future, it is hoped that a better and consistent recreation definition will be developed.

The value of an acitivity per hour on a per visitor day basis appears inconsistent when ranking and comparing some activities with others. However, if used properly, the total value by activity will be the same whether recreation days or visitor days are used, and they will rank consistently. One must keep in mind that we are basically allowing one person to do not more than one recreation day in a 24-hour period. Thus, a recreation day of deer hunting is worth $6.00/RD on an 8-hour basis or $9.00 on a 12-hour visitor day basis. If a 5-hour recreation day of coyote hunting is worth $5.50/RD, then it would have a value of $13.20 per 12-hour visitor day.

To take this data and make an assumption based on a 12-hour day that coyote hunting is worth $1.10/hr. and deer hunting is worth $0.75/hr. is incomplete and incorrect because of the average time factor involved with each type of experience. On a visitor day basis, coyote hunting requires 2.4 hunting experiences, while deer hungting requires 1.5 experiences.

Thus, dollar per hour benefit index values can only be used when one consistently follows the given hours-per-recreation-day principle, using the listed items for the different activities or developing new ones if needed.

Converstion Factors - Recreation Days to Visitor Days

The conversion of total amount of use and the unit values back and forth between Recreation Days and Visitor Days can be accomplished by two or more methods. These methods are (1) Hours of participation and value per hour, and (2) Direct time and value conversion factors. one may be preferred over the other depending on available data. If the average number of hours per day spent participating in a type of recreation are known, then method (1) may be the easier.

A table of general conversion factors has been developed for use in the Pacific Southwest area, see Table E-7. Where conditions are not applicable or the particular type of recreation is not shown on the table, procedure (1) or (2) can be applied as shown in the examples that follow Table E-7.

TABLE 3-7. General Pacific Southwest Conversion Factors for Recreation and other Related Commodities or Outputs 1/

Use Category	Primary Use	Ave. Recreation Day Participation Time - HRS/RD	Benefit Value Conversion Factor = X1 or $/RD to $/VD	Use Conversion Factor = X2 or RD to VD
Wildlife-Fisheries		X_T	X_1	X_2
	Fishing			
	Cold Water	7	1.71	0.58
	Warm Water	6	2.00	0.50
	Hunting			
	Big Game	8	1.50	0.67
	Small Game	5	2.40	0.42
	Upland Game	5	2.40	0.42
	Waterfowl	6	2.00	0.50
	Wildlife Observation & Photography	4	3.00	0.33
Recreation				
	Camping			
	Overnite	13	0.92	1.08
	Day & Nite	17	0.70	1.42
	Picnicking	2	6.00	0.17
	Boating-Pleasure	5	2.42	0.42
	-Fishing	6	2.00	0.50
	Sightseeing & Scenic Viewing	3	4.00	0.25
	Trails-Walking & Hiking	3	4.00	0.25
	Rock Collecting	5	2.40	0.42
	Skiing-Snow	5	2.40	0.42
	-Water	3	4.00	0.25
	Flora Observation	3	4.00	0.25
	Snow Mobiling	6	2.00	0.50

NOTE: Application of X_1 and X_2 conversion factors: (RD) (X_2) = VD 4/ and($/RD) ($X_1$) = $/VD 3/

1/ Conversion factors may need adjustment for regional, local, or site user characteristics

2/ Definitions: VD = Forest Service 12 hours visitor day.
RD = Recreation Day. A visit to an area and participation in recreation during any reasonable portion or all of a 24-hour period. By definition one person can only represent one recreation day in one 24-hour period; despite the fact that the person engages in several activities. For purposes of comparison - the 24-hour period is the calendar day. See Senate Doc. 97, Supplement 1.

3/, 4/ X_2 was derived by dividing HRS/RD by HRS/VD and X_1 was derived by dividing HRS/VD by HRS/RD. For examples and further explanation, see the section on conversion procedures, method 2, example 1.

Example Conversion Methods

Method (1) Hours of Participation and Value Per Hour

This method using data in either recreation days or visitor days will result in the same total value for the type of use described. Conversion of use between VD or RD units is done by using the (X_1) Value Conversion Factors and (X_2) Use Conversion Factor coefficients in Table -7 or similarly developed local area tables.

Step 1 Using Guidelines determine the dollar value for a recreation day = $/RD

Step 2 Determine the average number of hours of participation in the activity = HRS/RD

NOTE: Column X_T of Table -7 has average hour factors developed for the Pacific Southwest.

Step 3 Determine the dollar index value on a per hour basis - $/HR

$/HR = $/RD ÷ HRS/RD

e.g. = $6.00/RD ÷ 8 HRS/RD

= $0.75 HR Recreation Value

Step 4 The value per recreation day ($/RD) is derived directly from the recreation value guide or it can be calculated by multiplying the dollar per hour value times the hours per recreation day.

$/RD = ($/HR) (HR/RD)

e.g. = ($0.35/HR) (5HR/RD) = $1.75/RD

Step 5 The total index value per year or season is derived by multiplying the dollar index value per recreation day by the total number of recreation days per year or season.

Total Value = (RD/YR) ($/RD)

e.g. = (12,000 RD/YR) ($1.75/RD)
= $21,000/YR

Step 6 The value per visitor day ($/VD) is derived by multiplying the dollars per hour value ($/HR) from Step 3 by the number of hours per visitor day (HR/VD) which is a standard 12 hours for the U. S. Forest Service.

$/VD = ($/HR) (HR/VD)

= ($/HR) (12 HR/VD)

e.g. = ($0.35/HR) (12HR/VD) = $4.20/VD

Step 7 The total benefit value per year or season is derived by multiplying the dollar value per visitor day by the total number of visitor days per year or season. This can be converted to a per acre basis later if needed.

Total Value = (VD/YR) ($/VD)

= (8,000 VD/YR) ($4.20/VD)

= $33,600/YR

Method (2) Direct Time and Value Conversion Factors

This method uses the time spent participating in an activity and the derived conversion factor to calculate use and dollar benefit index value.

Example No. 1

Area B has 20,000 camping visits per year as interpreted from surveys and counter data. It is estimated that approximately 60% of the visits involve only a brief overnight stay that have an average duration of about 14 hours. The remaining 40% camping involves both day and nite use of the area for general camping purposes. The average duration of stay is estimated at 38 hours which is equivalent to 3 recreation days.

Total recreation days involved are calculated as follows:

The overnite visit represents one recreation day or a conversion factor of 1.0 RD/visit. The day and nite use has a conversion factor of 3.0 RD/visit. This is based on the participant using part of the day before the first nite of camping and part of the day after the second nite of camping.

Total recreation days are calculated first:

A. 20,000 visits (0.60) (1.0 RD/visit) = 12,000 RD overnite

B. 20,000 visits (0.40) (3.0 RD/visit) = 24,000 RD day and nite

The recreation days can be multiplied by the value per recreation day, dervied from the value guides, to obtain a total value figure. If use and index values are needed in terms of visitor days, conversion factors can be calculated as follows:

Overnite Camping - 14 hours/visit = 1 RD

X_2 = VD/RD = HR/RD ÷ HRS/VD

= 14 HR/RD ÷ 12 HR/VD

= 1.17 VD/RD Use conversion factor

Total Overnite Camping in Visitor Days = 12,000 RD (1.17 VD/RD)

= 14,040 VD

Total Value = 14,040 VD (.86 RD/VD) ($1.20/RD) = $14,489

Day and Nite Camping - 38 hours/visit - 3RD

X_2 = VD/RD = HR/RD ÷ HR/VD

= 13 HR/RD ÷ 12 HR/VD

= 1.08 VD/RD Use conversion factor, e.g. 10 RD x 1.08 VD/RD
= 10.8 VD

X_1 = RD/VD = HR/VD ÷ HR/RD

= 12 HR/VD ÷ 13 HR/RD

= 0.92 RD/VD Value conversion factor, e.g. $1.50/RD x 0.92 RD/VD
= $1.38/VD

Note: Average HR/RD = 38 HR ÷ 3 RD

= 12.7 HR/RD or 13 HR/RD

Total Day and Nite Camping in Visitor Days

= 24,00 RD (1.08 VD/RD) - 25,920 VD

Total Value = 25,920 VD (0.92 RD/VD) ($1.70/RD) = $40,539

Example No. 2

The use and value conversion factors can also be derived from information on the basic characteristics of the recreation user.

Given:

Location - Area No. 7. Zone 2

Major Use Category - Camping (Day or Night)

User Characteristics - average size of party = 2.9 persons per visit

average length of stay = 82 HR or 3.4 days

present average use 15,500 RD/YR

Calculations

Total Hours = (82 HR) (2.9 persons) = 237.8 HR

The recreation days per person per trip (based on standard recreation day definition table E-7, footnote 2) would be 4 recreation days - RD = 4

Total recreation days = (2.9 people) (4 RD) = 11.6 RD

The average participation time base in hours is derived by dividing the total hours by the number of recreation days

Time Base = HR = (237.8 HR) ÷ (11.6 RD) = 20.5 HR or 20 HR

The use conversion factor (X_2) for recreation days to visitor days is derived by dividing the calculated hours per recreation day (HR/RD) by the standard 12 hour Forest Service visitor day (HR/VD)

X_2 = VD/RD = (HR/RD) - (HR/VD)

= (20 HR/RD) - (12 HR/VD)

= 1.7

The dollar benefit value conversion factor (X_1) for recreation days to visitor days is derived by dividing the standard Forest Service hours per visitor day (HR/VD) by the calculated hours per recreation day (HR/RD)

X_1 = $RD/$VD) - (HR/RD)

= (12 HR/VD) - (20 HR/RD)

= 0.6

The total benefit value per year from camping is then derived. First the value per campin g recreation day is obtained using

the recreation value guide. This converted to visitor days using (X_1) conversion factor and multiplied by the total visitor days per year.

$/YR = ($/VD) (VD/YR)

$/YR = [($/RD) (X_1 value conversion factor)] [(15,500 RD/YR) (X_2 use conversion factor)]

$/YR = ($1.80/RD) (o.6 RD/VD) (15,500 RD/YR) (1.7 VD/RD)

= ($1.08/VD) (15,500 RD/YR) (1.7 VD/RD)

= ($1.08 VD) (26,350 VD/YR)

= $28,458.00/YR

This value can be converted to a per acre per year figure if needed.

Example No. 3 Development of a Weighted Mixed Use Recreation Value

To facilitate a better analysis and develop more meaningful interpretations from them, primary recreation uses should be individually listed and benefit values derived. In the case where an identified primary use really represents a mix of two or three major uses, then the benefit index value should be weighted. Fisheries oriented camping is such a case (this assumes the fishing was not accounted for elsewhere).

Fisheries Oriented Camping Value - Method 1

Primary Use Mix Method

Given:

Camping Mix = 30% General Day and Nite Camping and 70% Camping and 70% Camping Primarily for Fisheries

General Camping	Camping Primarily for Fishing 3/
$1.35/RD 1/	$3.60/RD 1/
0.7 RD/VD 2/	1.5 RD/VD 2/
$0.94/VD Subtotal	$5.40/VD

30% Use Mix	70% Use Mix
$0.94/VD (0.30) = $0.28/VD	$5.40/VD (0.70) = $3.78

Value per Visitor Day = $0.28/VD + $3.78/VD = $4.06/VD

1/ Derived from General Recreation Guide or Special Recreation Guide and Table -6. A Step-by-Step Derivation of Visitor Day Benefit Value - Using Recreation Guides.

2/ Derived from conversion factors in Table -7.

3/ The recreation days of fishing were not separated out from camping by the source of data. If they were, a visitor day value for fishing and camping could be developed separately.

2. WOOD FIBER - SAW TIMBER & PULP LOGS

Basic Procedures

The Modified Appraisal Approach is used to develop benefit values and cost values for wood fiber. The basic 2400-17 appraisal form is used.

These index values (selling price L.S.) are generally updated on a quarterly basis during each year.

Deriving Wood Fiber Benefit Values

The Benefit Value is the mill selling price log scale (Item 5, Form 2400-17) by the regional appraisal schedule. Recent sale appraisals within or adjacent to the area may provide data that is current and adequate. See Figure E5. Example Appraisal Summary.

Wood Fiber Cost Value Guide

Basic Procedures

The Modified Appraisal Approach will be used to set up an initial costs for wood fibre. This requires using the basic 2400-17 form in a step-by-step process (see Figure E5).

Usually current existing sale appraisals on the area or adjacent areas can be used for data that more nearly fit the local conditions. Some of these cost values are updated periodically during the year, the most current data should be used.

Calculating Wood Fiber Costs

Use the basic tables provided on the Form 2400-17 as follows:

Figure E5 APPRAISAL SUMMARY Example Form 2400-17

SALE UNIT_____

Log haul: Truck_____ miles (20-22) Lumber haul: Truck_____ miles Summary checked by: _____ Date: _____

Rail_____ lbs

Appraised to _____ Appraisal base period _____, adj. to _____

Road construction miles: Specified _____ (23-26), Temporary _____ (27-30)

Line No.	ITEM	Unit-[ ] MBF; [ ] 2 Cord →							TOTAL (T) OR AVERAGE (A)	
		Species →								
		% By Species →	%	%	%	%	%	%	T	100.0%
1	Volume								T	
2	Selling price L.T.								A	
3a										
3b										
3c										
4a	Overrun % factor									
4b										
5	SELLING PRICE L.S.								A	(31-35)
6	Falling and bucking								A	(36-39)
7	Skidding and loading								A	(40-43)
8										
9	SUBTOTAL, stump-to-truck									
10	Haul								A	(44-47)
11	Road maintenance								A	(48-51)
12	SUBTOTAL, transportation									
13	General logging overhead								A	(52-55)
14										
15										
16	Logging depreciation								A	(56-59)
17	SUBTOTAL, administrative									
18	Slash disposal								A	(20-23)
19	Erosion control								A	(24-27)
20	Snag disposal								A	(28-31)
21	Misc.								A	(32-35)
22	SUBTOTAL, contractual									
23	Temporary roads								A	(36-39)
24	Other temporary developments								A	(40-43)
25	SUBTOTAL temporary developments									
26	SUBTOTAL, logging costs								A	
27	Specified road costs (A10, table 6)								T	
		← S OUT							A	(44-47)
28	TOTAL LOGGING COST L.S.								A	
29	Mfg. cost L.T.								A	
30										
31	MFG. COST L.S.								A	(48-51)
32	TOTAL PRODUCTION COST L.S.								A	(52-56)
33	CONVERSION (5)-(32)								A	
34	Normal P&R margin								A	
35	Normal P&R ratio - %								A	
36	Indicated stumpage (33)-(34)								A	
37	Indicated advertised rates (36)+(27)								T	
									A	
38	Base rates								A	
39	Line 37 adjustments								A	
40	ADVERTISED RATES (37) + (39)								T	
									A	
41	Advertised P&R margin								A	
42	Advertised P&R ratio - %								A	
43	Base indices									

BENEFITS

COSTS

Line 41 equals either: (1) 34A, if 36A is greater than 38A, or (2) 33A minus 38A, if 36A is less than 38A. 4.01

GPO 933-864

Implementation
or Initial costs - 1. Logging costs of bucking, loading, hauling, etc., (Items 6-17 of 2400-17). You may want to use stratified averages from 2400-17's for forest, regional, or subregional values.

Implementation
or Initial costs - 2. Logging costs of slash disposal, erosion control, temporary roads, etc., (Item 18-24 of 2400-17) should be realistic figures from RO and/or SO data.

Item 27 specified roads are not included with wood fibre but are handled separately as specific road activity in the analysis.

Implementation
or Initial costs - 3. Manufacturing costs (Items 29-31 of 2400-17's) based on RO and/or SO appraisal schedules.

Implementation
or Initial costs - 4. Profit and risk margin (Item 34 of 2400-17's). This should be a realistic figure or range of figures.

Costs over and above those on Form 2400-17 include:

Planning costs - 5. Sale planning and layout costs for the area.

Operating costs - 6. On-the-ground timber sale administration costs for the area.

3. Livestock Grazing Benefits

Forage, like water in many aspects, is generally used as a raw material or input for the production of an output, e.g., beef from cattle, that has a direct benefit or value. The direct user is the livestock owner and he measures his net benefits, except for certain cases, in pounds of beef produced and their net return. The value of the forage is its portion of the net return from beef production.

The three methods considered to derive the value of forage include:

1. Competitive Market Area Value
2. Pounds Gain Procedure
3. Time Proportion (Time and Pounds Gain) Procedure

The value method used with the forage resource will normally the the Competitive Market Area Value - No. 1:

The competitive area market approach (1) is easier to use and requires less information. Some problems may arise in new forage production where marginal values instead of average values should be used. This may not be a serious shortcoming if large changes in production within a given area, country, or counties are not expected to occur, and any new or additional costs of getting into and maintaining production are included in the analysis.

Each method has advantages and disadvantages and which one to use may depend heavily on the objectives and level of evaluation. Method number (2) and (3) require more detailed information and (3) is to be used when (2) is not directly applicable, such as use of grazing not specifically for gain in weight but for basic sustenance for a particular period within a given production operation.

Production (AUM's) by year and value (dollars) figures for with and without the proposed treatment or action are needed before the benefits can be determined.

Local commercial rental rates for range similar to National Forest range are the best sources for competitive market area value information. These rates are generally between $3 and $5 per AUM in California. Size of project and the relative cost of utilizing the area will have a strong bearing on the demand and value for forage. When local rates are used, an appropriate adjustment must be made for local differences in public versus private cost item, as was done for the Western States in the 1966 F.S. Grazing Fee Study, (Range Table No.1). For example, if the costs of moving cattle to and from the allotment, herding, etc. added up to $1.00 more per AUM than using local private range, the N.F. grazing fee would be $1.00 less than the local private rental rate.

RANGE TABLE I

Itemized Costs per Animal Unit Month for Grazing
Livestock on Forest Service and Private Lands

Cost Item	Cattle		Sheep	
	Public	Private	Public	Private
Lost Animals	$ .61	$ .38	$ .72	$ .69
Association fees-private lease	.19	1.86	.05	1.64
Veterinary	.13	.14	.10	.13
Moving livestock to and from allotment	.33	.24	.39	.27
Herding	.47	.16	1.48	.73
Salting & feeding	.41	.85	.29	.81
Travel to & from allotment	.41	.27	.50	.33
Water	.04	.07	.07	.09
Horses	.23	.10	.24	.06
Fence maintenance	.27	.28	.08	.14
Water maintenance	.18	.10	.08	.07
Development depreciation	.13	.02	.06	.02
Other costs	.17	.12	.28	.25
Total Costs - National Forest System lands in Survey 1/	3.59	4.60	4.35	5.24
National Forests, 11 Western States	3.75	5.32	4.49	5.82
Difference between N.F. & rented private (grazing fees not included)		1.57		1.33

1/ Summation may not equal total costs due to rounding.

Forage Conversion Factor Tables

Forage Conversion Coefficients - AUM Equivalents

DRY WEIGHT ALLOWANCE

A. Forage consumption table for cattle.

Cattle	Animal Unit Factor - AUM[1/]	Daily Dry Weight Consumption-lbs.
1,000-lb. animal	1.00	24
Dry Cow	1.00	24
Cow plus 300-lb. calf	1.36	33
Cow plus 400-lb. calf	1.46	35
Cow plus 500-lb. calf	1.55	37
Yearling	0.74	18
Weaned calf	0.60	
Unweaned calf	0.40	
Bull	1.25	

B. Forage consumption table for sheep

Sheep	Sheep Unit Factor - AUM	Daily Dry Weight Consumption
125-lb. ewe	0.20	4.1
Ewe plus 30 to 40-lb. lamb	0.26	5.3
Ewe plus 40 to 50-lb. lamb	0.28	5.7
Ewe plus 50 to 60-lb. lamb	0.30	6.2
Ewe plus 60 to 70-lb. lamb	0.32	6.6
Ewe plus 70 to 80-lb. lamb	0.33	6.8
Ewe plus 80 to 90-lb. lamb	0.34	7.0
Ewe plus 90 to 100-lb. lamb	0.36	7.4
Ewe plus 100 to 110-lb. lamb	0.38	7.8

C. Forage consumption table for other animals

Animal	Animal Unit Factor - AUM
1000-lb. cow	1.00
Dry Cow	1.00
Yearling	0.74
Horses	1.25
Sheep (adult)	.20
Mule deer	.19

1/ AUM - Based on a 1,000-lb. animal

DRY WEIGHT ALLOWANCE

D. Forage consumption table for other animals - cont'd

Animal	Animal Unit Factor - AUM
Other deer	.15
Elk	.50
Antelope	.12
Moose	.70
Mountain goat	.17
Mountain sheep (Bighorn)	.19

4. Hydro-Electric Power Generation

Water values from electric power generation are derived from two basic power components, Energy and Capacity. Dependable capacity is used here to set a consistent base. Energy value comes directly from the water moving through the turbines and is credited 100 percent (1.00) to water. However, since dependable capacity for power is related primarily to the plant and the attendant facilities, only a proportion of the dependable capacity values is assigned to the water that is associated with the minimum head of water or head under adverse water conditions. The proportion credited to water is a 20 percent (0.20) unless otherwise stated or imputed.

Energy is measured in mills per kilowatt hour. Dependable capacity is measured in dollars per kilowatt year and are usually based on four different value schedules or a combination of them. These schedules are:

1. Public (Federal)
2. Public (Non-Federal)
3. Private
4. Composite (Federal, Non-Federal, Private)

Normally Public (Federal) rates, obtained directly from the local Regional Office Federal Power Commission and not the owner or operator of the installation, should be used. In certain cases, the FPC may use a composite rate. In any case, rates should be from the FPC if consistent analyses are to be made with other resources.

Deriving Benefit Values for Power

Energy values are basically derived by multiplying the average annual gross power output in kilowatt hours (KWH) by the value in mills per kilowatt hour (mills/KWH). This value can be adjusted by a percent planned use to derive the net power output or value. In actual practice one usually gets the yearly and monthly net power output figures which can then be averaged and concerted directly to average total dollars per year. This divided by the water intake gives dollars per acre foot. Acre-foot volumes are sometimes available directly from the plan operator. Often it is obtained indirectly by using the H/K factor to convert energy in KWH to cubic feet per second of flow.[1/] Cubic feet per second of flow (cfs) can then be converted to total acre feet volume per year (AF/YR). More detailed procedures can also be used that take in account the number of days, hours, and station load a plant operates at.

1/ H/K factors or coefficients obtained from FPC Form 4 or 4A. Use full station load coefficients unless typical power plant operation is less than full load.

Exmaple basic calculations of energy are as follows:

Energy in KWH = Average annual power output
Total Value (KWH) ($/KWH)
Value per acre foot - $\frac{\text{Total Value}}{\text{AF/YR}}$

Where: Average
Acre feet per year = (Ave KWH/YR) X (AF/KWH)

$$\text{AF/KWH} = \frac{\text{(cfs)}}{\text{(KW)}}\ \underline{2/} \quad X \quad \frac{\text{(1.983 AF/cfs)}}{\text{(24)}}$$

Example:

Acre feet per kilowatt hour = AF/KWH

$$= \frac{0.06 \text{ cfs}}{\text{KW}} \quad X \quad \frac{\text{2AF/CFS}}{\text{24 hrs}}$$

$$= \frac{0.06 \text{ AF}}{\text{24 KWH}} = 0.002 \text{ AF/KWH}$$

Example calculations for a detailed analysis of energy hydropower at a given site for a specific season or month would be as follows:

Energy in KWH = (discharge in cfs) (H/K factor in KW/cfs) 3/
(number of days) = KWH
Value - (Energy in KWH) ($0.002/KWH)

Example: Winter Hydropower Value

(Energy = (3000 cfs) (10.0 KW/cfs) (183 days)
(24 Hr./day) = 273,520,000 KWH

Value = (263,520,000 KWH) ($0.002/KWH) = $527,040.00

This value can be divided by the total acre feet of water to give the power value per acre feet:

Example: $527,040.00 ÷ (3000 cfs) (2 AF/cfs) (183 days) = $0.48/AF

2/ cfs/KW rate is obtained directly from FPC Form 4 or 4A as described in footnote one.

3/ H/K factor KW/cfs = $\frac{1}{\text{cfs/KW}}$: where cfs/KW for a given power plant taken directly from the FPC Schedule 4 sheet.

In some types of analyses or in using certain analysis tools, one may have to solve for specific kinds of data. This requires taking the basic equation as shown previously and solving it for the parameter needed. As an example, the total acreage annual energy in KWH may be known and the water required to produce it if not known has been back calculated using the basic power plant characteristics and formula previously shown. If a program requires a data input like average hours per day plant operation, one must rearrange the basic formula and calculate it.

Example: Data needed = average HR/day operations

Basic Formula: KWH/YR = (Ave cfs) (KW/cfs) 3/ (days/yr) (hrs/day)

Solution: We choose to assume a large plant operates 365 days per year, then:

$$\text{HRS/DAY} = \frac{\text{Ave. KWH/YR}}{\text{(Ave cfs) (KW/cfs) (365 D/Yr)}}$$

3/ H/K factor $\text{KW/cfs} = \frac{1}{\text{cfs/KW}}$: where cfs/KW for a given power plant is taken directly from the FPC Schedule 4 sheet.

Example *Schedule 4*

HYDROELECTRIC PLANT DATA

For 1965 and every fifth year thereafter (1970, 1975, 1980, etc.) this entire schedule should be filled in *completely* for each conventional hydroelectric plant of 10,000 kilowatt installed capacity or greater. Do not refer to previously reported data in reporting for every such fifth year. *For each of the intermediate years (1966, 67, 68, 69, 1971, 72, 73, 74, etc.)* this schedule should be filled in for each such plant as referred to in the preceding paragraph:

(a) Which was constructed, purchased, or leased and placed in operation by the respondent during the year; or
(b) Which was altered during the year—i.e., water wheels, generators, or other equipment installed, remodeled, removed from service, or otherwise changed; or
(c) Whose capability was modified as a result of changes during the year in dams, spillways, or other structures of the project, or in available storage at or above the site; or
(d) Which was not previously reported.

Enumerate those plants in which no changes occurred which affect *any* of the data last reported under this schedule and make the following notation for each: "Data for this plant last reported in FPC Form No. 12, 19..., is correct as of December 31 of the herein reported year." Make this reference to such last reported data only in reporting for the intermediate years. Use addendum sheets as necessary.

(1)	Plant Name Narrows (2)	
A. PLANT LOCATION		
River on which located		2
State		3
County		4
Post office		5
B. STATION DATA		
Total installed generator capacity—name-plate ratings (including auxiliary units)—kw [1]	9,350	6
Net plant capability under the most favorable operating conditions—kw	12000 Power Factor 95 Percent [2]	7
Net plant capability under the most adverse operating conditions [3]—kw	Dep. Cap. Rate 7000	8
Estimated average annual potential output on basis of present installed capacity—kwh	72,000,000	9
If adequate records are available, specify which year of stream flow may be used to determine both the magnitude and distribution of the average annual potential output		10

Estimated over-all water use in c. f. s. per kilowatt and corresponding head for the following loads under headwater conditions which approximate average conditions. Give the kilowatt output for each load:

	C. f. s. Per Kw	Corresponding Head—Feet		
		Gross [4]	Net [5]	
One-half station load (kilowatts 6000) H/K Factors	.0607	240	238.5	11
Three-fourths station load (kilowatts 9000)	.0566	240	237.0	12
Full station load (kilowatts 12,000)	.0656	240	232.7	13

Method of operation—automatic or remote control (A), semiautomatic (SA), manual (M)	14
Number of future units provided for in present plant	15
Planned ultimate generating capacity—kw	16

$$H/K = \frac{1}{CFS/KW}$$

C. HYDRAULIC DATA

Drainage area—square miles	17
Pondage or storage available at site:	
1. Area of pond at normal full pond level—acres	18
2. Maximum draw-down from normal full pond level—feet	19
3. Storage or pondage from maximum draw-down—acre-feet	20
Head—in feet, with full pond and full station load:	
1. Gross head (Pond elevation minus tailwater elevation) ..... feet	21
2. Effective net head (Gross head minus intake and conduit losses) ..... feet	22
Elevation.	
1. Normal full pond elevation—designate datum	23
2. Pond elevation used in estimating water use in lines 11, 12, and 13	24
Developed storage above site (list):	
1. Location and drainage area	25
(a) Usable volume—acre-feet	26
2. Location and drainage area	27
(b) Usable volume—acre-feet	28
3. Location and drainage area	29
(c) Usable volume—acre-feet	30

[1] Should agree with sum of columns 4 and 5, Schedule 1.
[2] Capability to be based on power factor condition normally to be expected at time of system peak. State power factor in space provided.
[3] Give cause of limitation and time of year.
[4] Pond elevation minus tailwater elevation with pond at normal or average elevation.
[5] Gross head minus intake and conduit losses.

HYDROELECTRIC PLANT DATA—Continued

D. INSTALLATION DATA

Name of Plant..... Name of System .....

Number of main generating units..... Number of auxiliary generating units..... (Indicate below which are auxiliary units)

	Unit Nos.....	Unit Nos.....	Unit Nos.....	Unit Nos.....	Unit Nos.....	
For each unit or group of identical units show the following (if necessary attach additional sheets):						
1. Waterwheels:						
(a) Design head—feet						31
(b) Operating speed—revolutions per minute						32
(c) Maximum horsepower capacity at design head						33
(d) Type of runner—Francis (F), fixed propeller (F. P.), automatically adjustable propeller (A. P.), impulse [1]						34
(e) Type—horizontal, vertical, or inclined						35
(f) Year installed [2]						36
(g) Manufacturer						37
2. Generators:						
(a) Name-plate rating in kilovolt-amperes						38
Name-plate rating in kilowatts						39
Name-plate rating—power factor						40
(b) Continuous overload capacity in percent						41
(c) Voltage						42
(d) Phase and frequency or d. c.						43
(e) Year installed [2]						44
(f) Manufacturer						45

E. STATION STEP-UP TRANSFORMERS

Data are to be furnished for each transformer or group, i. e., one or more banks, of identical transformers, including spares

	Group 1	Group 2	Group 3	Group 4	Group 5	
Number of identical transformers: (a) In service						46
(b) Spare						47
Type: If auto, specify						48
Phase and frequency						49
Capacity of each transformer in kva:						
(a) Normal rating						50
(b) Maximum continuous rating with forced cooling (if installed)						51
Voltage, in kv.: Primary						52
Secondary						53
Tertiary						54
Bank connection (Δ, V, Y, grounded Y, or other):						
Primary						55
Secondary						56
Tertiary						57
Bank capacity, in kva.: Primary						58
Secondary						59
Tertiary						60

1. Report reversible units on schedule 4-A.
2. If not new when installed, show also by footnote the year equipment was manufactured and the year rebuilt.

Dependable capacity values for power are basically derived by dividing the dependable capacity rate, obtained off the FPC schedule 4 sheet, in kilowatt hours by the number of hours per year to arrive a kilowatt-years (KW-YR). The dependable capacity is then multiplied by the value in dollars per kilowatt-years with a percentage adjustment for the fact that this value cannot be totally credited to water. An example problem has been set up to illustrate this process.

Given: 142,496,000 KWH/YR of dependable capacity from Federal Power Commission and H/K factor of power plant = 100 KW/cfs

Dependable Capacity in KW-YR 1/

$$= \frac{\text{KWH/YR}}{\text{8760 HR/YR}} = \text{KW-YR}$$

Value = (KW-YR) ($KW-YR) (% water value adj. factor) = $/YR

Value per Acre Foot = ($/YR) ÷ (AF/YR) = $/AF

Note:

AF/YR at Dependable Capacity =

$$= \frac{(365\ \text{D/YR})\ (2\ \text{AF/cfs/D})\ (\text{KWH/YR})}{(\text{KW/cfs})\ (365\ \text{D/YR})\ (24\ \text{HR/D})}$$

$$= \frac{(\text{KWH/YR})}{(\text{KW/cfs})\ (12)} = \text{AF/YR}$$

where KWH/YR = (KW-YR) ÷ (8760 HR/YR)

where (KW/cfs) = H/K factor

where ($/KW-YR) for capacity is obtained from the FPC local Regional Office

Example:

$$\text{Dependable Capacity} = \frac{142{,}496{,}000\ \text{KWH/YR}}{\text{8760 HR/YR}}$$

$$= 16266.67\ \text{KW-YR}$$

Value = (16,266.67 KW-YR) ($22.15/KW-YR) (0.20) = $72,061.35/YR

Value per Acre Foot of Water @ 20% direct return to water

$$= \frac{\$72{,}061.35/\text{YR}}{107{,}951.5\ \text{AF/YR}} = \$0.688/\text{AF}$$ for dependable capacity

---

1/ These formulas used are approximations for average conditions.

Example con't

$$AF/YR = \frac{142,496,000\ KWH/YR}{(110\ KW/cfs)\ (12)}$$

$$= 107,951.5\ AF/YR$$

Deriving Cost Values for Power

Since the value of power, as furnished by the Federal Power Commission for a specific site, is calculated on a least cost alternative for equivalent power output, there normally is no cost factor to use in the resource analysis. Costs for the facilities and main transmissions hookup for the immediate plant area are already reflected in the values.

5. Sedimentation Reduction or Prevention

Sedimentation Impacts - Costs

Sedimentation usually has the effect of reducing the quality and/or the amount of other resource outputs. In some cases, such as water quality, it induces extra costs of water quality treatment. Once the approximate yearly amount of sediment being produced from a resource activity is determined, its impact cost is associated with the resources downstream that it affects. To simplify the analysis for these procedures, these sediment impacts were divided into four main groups. These are:

I. Impacts downstream on other resource outputs (opportunity costs of benefits foregone).

II. Costs of removing sediment from downstream impact sites, e.g., reservoirs, debris basins, irrigation canals; often (I) and (II) are in combination on the sediment is removed.

III. Direct impacts on anadromous fisheries production areas and resident fisheries habitat.

IV. Losses in water quality that cause lower production levels in crops or increase water treatment costs.

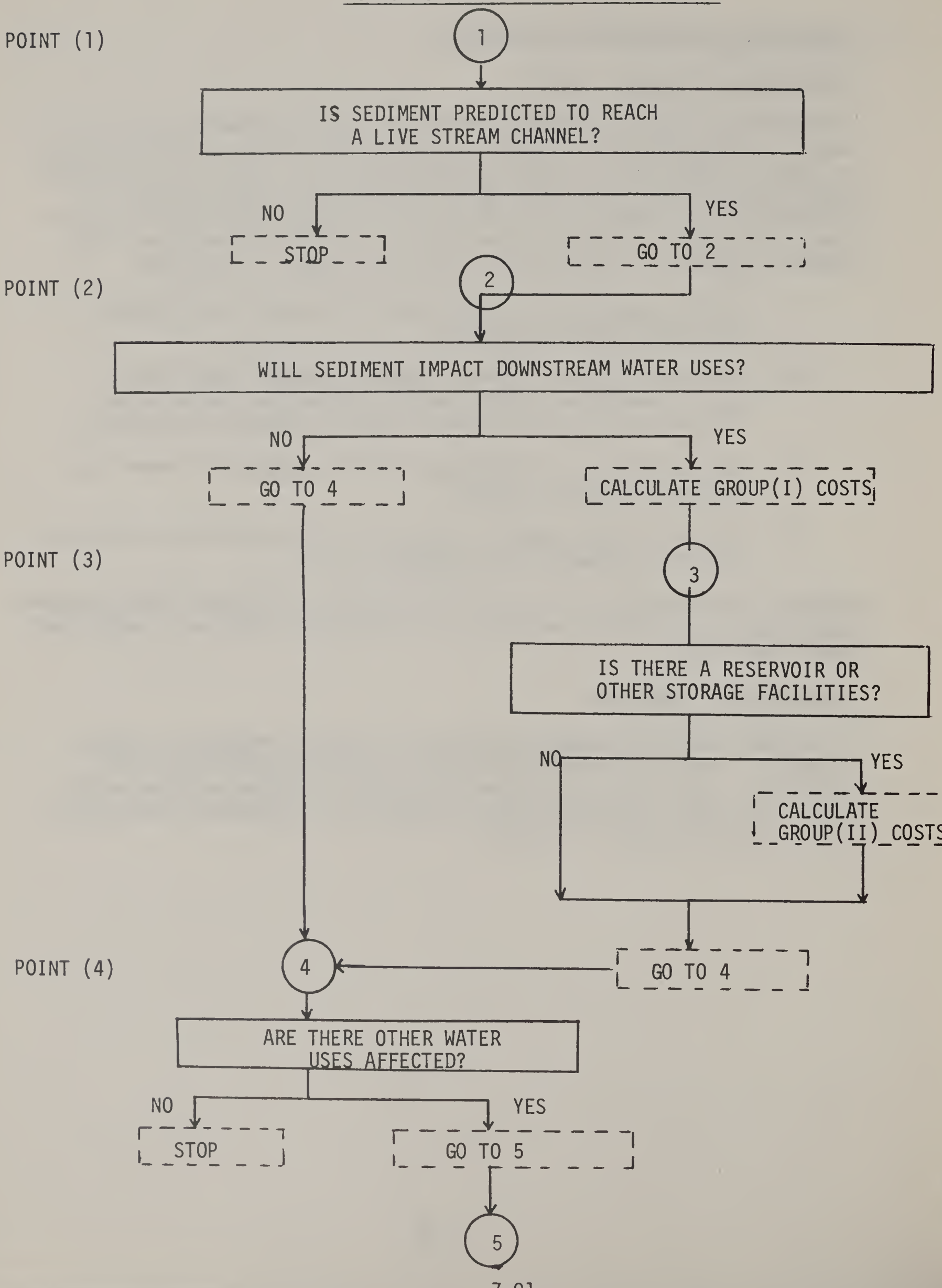
Generally information on (I) and (II) is readily available locally whereas groups (III) and (IV) may require data from special studies or additional local field work.

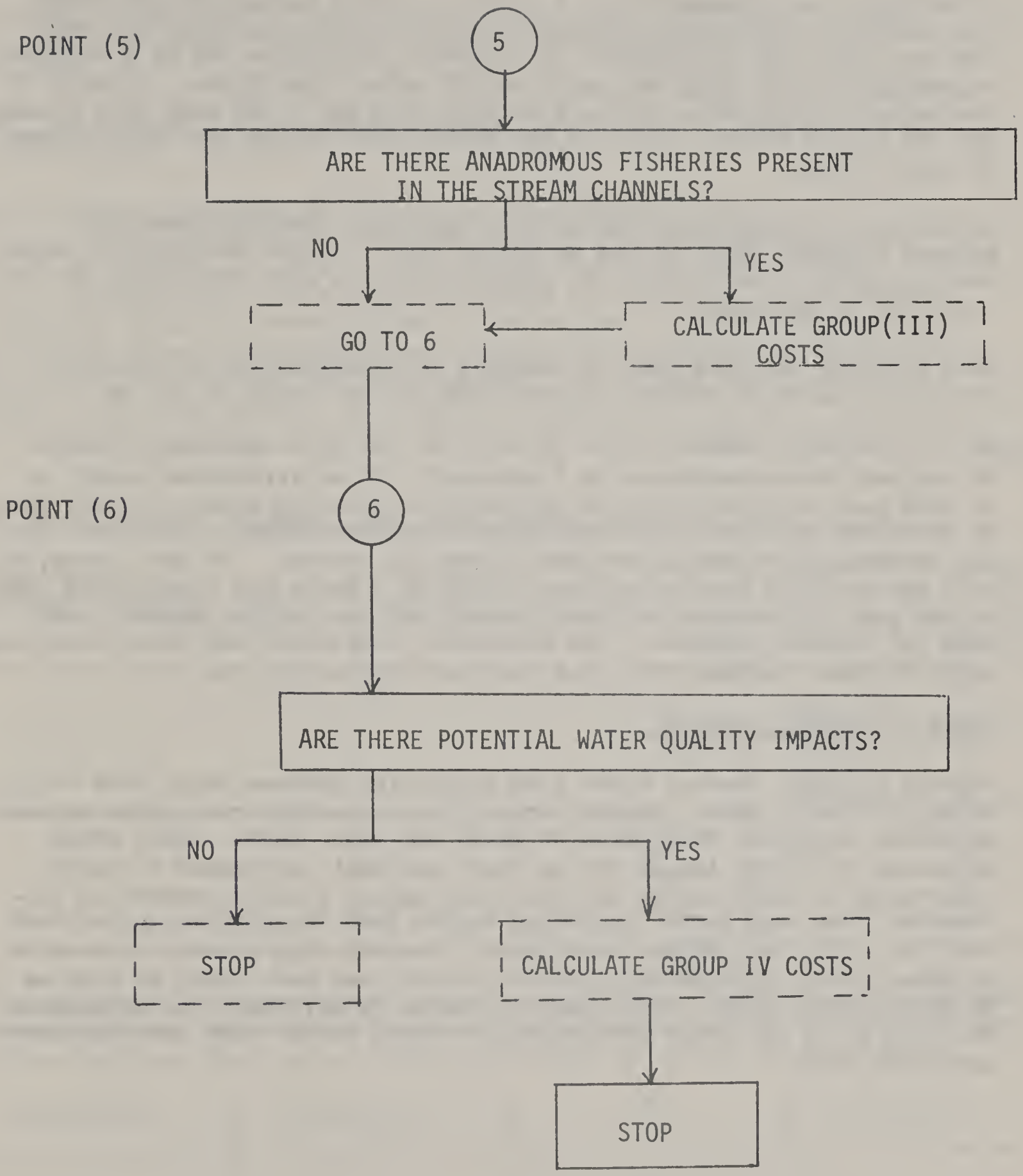
Sedimentation Procedures

If sediment from the proposed resource activity is reaching a stream channel, it may be affecting one or all of the four sediment impact categories. Each one is described separately to aid in setting up the data. See Figure 3 sediment impact diagram for calculating opportunity costs, decision points 1 through 6.

FIGURE 3

SEDIMENTATION IMPACT DIAGRAM FOR OPPORTUNITY COST CALCULATIONS




POINT (5)
5
ARE THERE ANADROMOUS FISHERIES PRESENT IN THE STREAM CHANNELS?
NO
YES
GO TO 6
CALCULATE GROUP(III) COSTS
POINT (6)
6
ARE THERE POTENTIAL WATER QUALITY IMPACTS?
NO
YES
STOP
CALCULATE GROUP IV COSTS
STOP

Group I. - Downstream Impacts (opportunity costs)

If sediment is accumulating at a point or points downstream and causes a reduction in the amount of usable water, then the value of the water lost per acre foot of sediment is its cost. The value can be a weighted percentage if more than one major use of water takes place. If half the water goes to crops and half to municipal use, then each will account for 50% of the value. refer to the Water Value tables for basic values by type of use.

If sediment is affecting storage in a reservoir over and above its planned sediment pool, it has an impact cost. If the reservoir or whatever is going to be cleaned out later, this is a cost from Group II that must be included.

Once the cost per acre foot of sediment is determined on the basis of the water values it affects, a cost time stream should be set up.

Group II - Sediment Removal Costs (S.R.C.) or SRC plus opportunity costs.
If sediment is accumulating at a reservoir, in an irrigation canal, or at some particular site and it can be expected to be removed in the future by dredging, then this is a cost induced by the sediment. The cost is the accumulated volume of sediment times its removal. In most cases, it is a situation of setting up data for Group I costs but terminating them at the year of expected sediment removal and then adding another cost item for removal expenses. The following description and table lists some basic sediment removal costs and cost conversion factors.

Costs of Sediment Removal

General sediment removal costs from irrigation systems range from $0.75 to $1.00 a cubic yard. Removal costs from accessible reservoirs of small to medium size cost from $2.00 to $2.50 per cubic yard. Those areas particularly within larger cities where sediment is trapped in large reservoirs or catch basins and the total amount finally removed is substantial, may have costs, including buying land for disposal sites that run from $4.00 to 7.00 per cubic yard. Removal from storage reservoirs in urban areas, particularly coastal cities, may have costs as high as $9.00 per cubic yard. If access to an area is difficult, an additional $1.50 to $2.00 per cubic yard should be added to the base cost for urban and rural areas.

Group III - Sediment Impacts (Opportunity Costs) on Anadromous Fisheries Habitat and Resident Fisheries Habitat

Anadromous Fisheries

If sediment, particularly fines, get into and cover sections of stream channels where anadromous fish spawn, then lower production rates can be expected. In other sections of channel that furnish resting holes and rearing habitat, sediment can be expected to cause additional fisheries' losses. These losses represent opportunity costs to both commercial and sport fisheries.

A table based on fisheries data from the North Coastal Region of California has been set up to approximate these fisheries values lost. The table is suitable for use on small and medium sized streams only where the total volume of additional sediment entering the stream channel is relatively small and ceases after the third year. These kinds of costs should be set up as annual repeating costs (type 2) starting with the second year of the project and ending with the last year of the duration of impact. The same applies for resident fisheries in the next sub-section. Larger sediment deposits of longer activity would have much more impact.

Table for Minimum Sediment Impact-Anadromous Fisheries Loss Costs

Average Total Additional Sediment - AF/YR	Miles of Stream Affected	Cost $/MI 1/	Type of Channel Habitat Section	Year of Impact (after Project)
0.3-1	1	714 492 261	Spawning Rearing Rearing & Resting	4
1.1-3	3	1008 690 366	Same	4

The timestream of sediment impact costs for anadromous fisheries are such that they usually do not show up until about the fourth year after the sediment gets into the channels. The general timestream would be set up as illustrated:

Value Type	Time Span Yr	Yr	Units	Value-$/MI
2 (Annual)	4	7	MI (1 or 3)	

1/ These are minimum opportunity costs derived from studies on Northern California Coastal acres, U.S.F.S., 1970. These should be used with type conversion only.

Resident Fisheries

The quality of stream habitat for resident fisheries, particularly for trout in this case, can be lowered by affecting both the quantity of fish and in general the quality of the fishing experience. This loss in fish numbers, catch rates, and quality degradation represents an opportunity cost to the stream resource.

A table, based on studies of various kinds of impacts imposed on trout streams, has been set up to approximate these fisheries values lost. It should be used with small and medium sized streams only, where the volume of additional sediment entering the stream is relatively small and it does not continue for more than three years. Larger amounts of sediment would have greater impact and duration of effect.

Table for Minimum Sediment Impact-Resident Fisheries Loss Costs

Average Total Additional Sediment - AF/YR	Range in Recreation Use - VD/MI/YR 1/	Stream Class 2/	Impact Cost-$/MI/YR	Duration of Impact-Yrs.
0.5 - 1.0	171-230 (ave 200)	I	690	3
		II	450	
	110-170 (ave 140)	I	480	
		II	315	
	40-80 (ave 60)	I	210	
		II	135	
1.1 - 3.0	171-230 (ave 200)	I	1035	3
		II	675	
	110-170 (ave 140)	I	724	
		II	472	
	40-80 (ave 60)	I	310	
		II	202	

1/ Fisherman visitor days based on standard Forest Service visitor day.

2/ See F.S. Manual supplement 2405.11
Stream Protection criteria and guides

Group IV - Water Quality Impacts

Losses due to downgrading of water quality occurs when municipal-industrial water must undergo additional treatment to remove suspended sediments and/or to lower mineral concentrations. Raising salt and mineral concentrations also affect the value of irrigation water. Murky water in recreation areas also lowers water-associated recreation values. The change in the value of the recreation day is a loss or social cost due to sediment.

These kinds of additional costs to the water users can be derived and set up by first determining the volume of water (AF/YR) used for a particular use and multiplying it by the percent of time per year it will be degraded. This volume times the water quality value per acre foot gives the cost per year induced by the sediment. This can be set up as single costs for three separate years if the impact is expected to vary considerably, or as annual payments for three years if it is not expected to vary much. Note that for recreation it would be the change in value by recreation day times the number of recreation days per year affected.

Example: (10,000 AF/YR) (15%/YR) ($9/AF)
= (1500 AF/YR) ($9/AF) for 3 years

Keep in mind that the described method would give the total cost of treatment for the time water is being degraded. This is OK if no treatment is done at other times.

If some treatment is done all the time, and we initiate a resource management activity which increases sedimentation, the cost of the sediment should just be the increased cost of improving quality, not the total cost of treatment.

Table of General Water Quality Values - $/AF 1/

Municipal Industrial Water	$/AF
Coastal & Valley Cities	
Filtering	$5
Softening	$4
Chlorinization	$3
Total	$12
Mountain Communities	
Filter	$7
Chlorinate	$3
Softening	$4
Total	$9
Additional Treatment	
Chlorides, etc.	$9
Agricultural Water	
Filtering	$5
Salt Dilution-Concentration	
Low	$2.50
Medium	$4
High	$9
Very High	$16

1/ Water Resources Center Contribution NO. 107, University of California, 1966. Colorado River, River Basin Studies, Special Working Papers, 1969.

6. New Water

Where water yield estimation procedures shown that new or additional water is expected to be produced, the water should be related to its relative value in its various predicted uses. Special diagrams and tables have been set up to help do this. But first, there are certain criteria that must be considered. These have been listed in order and relate directly to the Water Value Decision Criteria Diagram that follows. (See Figure 2 Decision Criteria Diagram).

Water Value Criteria or Points:

1. Is there an exisitng and a future demand for all or some of the new water - either on or off (downstream) from the National Forest. Check local water users, S.C.S., and Cooperative River Basin Framework Studies.

2. If (1) is yes, then how much water in acre feet per acre is produced. See procedure for estimating Base Water Yield - New Water described in the sections that follow the water value criteria.

3. If (2) is "yes", i.e., there is an increase in water yield, then estimate the percentage of base on-site water that can get from the conversion site to a live year-round stream channel. It is assumed here that additional in-channel losses in the live stream are negligible to the amount of new water produced. However, where this water travels through 15 miles or more of phreatophyte channel before reaching its potential use point, reduced the new water available by 35% (evaporation is assumed to remain constant and has no effect on the availability of new water).

4. If (3) is not "0", then check the expected timing of the new water flow or if the water can be stored in a reservoir for release later in the summer or fall.

5. If (4) shows that the water can be stored or at least 60% reaches the use area after June 15, then estimate the amount of new water that would go to each of the major water use categories as listed.

6. Go to the water value tables and apply these percentages to the appropriate water values or value in each use category. Add up the individual category values that were multiplied by the percentages, and the result will be a weighted water value for all new water.

7. Set up the year-to-year water yield volume adjustment factors (Yield time-streams) using the base water yield as the 100% yield factor.

NOTE that: Acre feet per acre water yield at the use point, times the weighted water value, equals total dollars per acre for a given year - example:

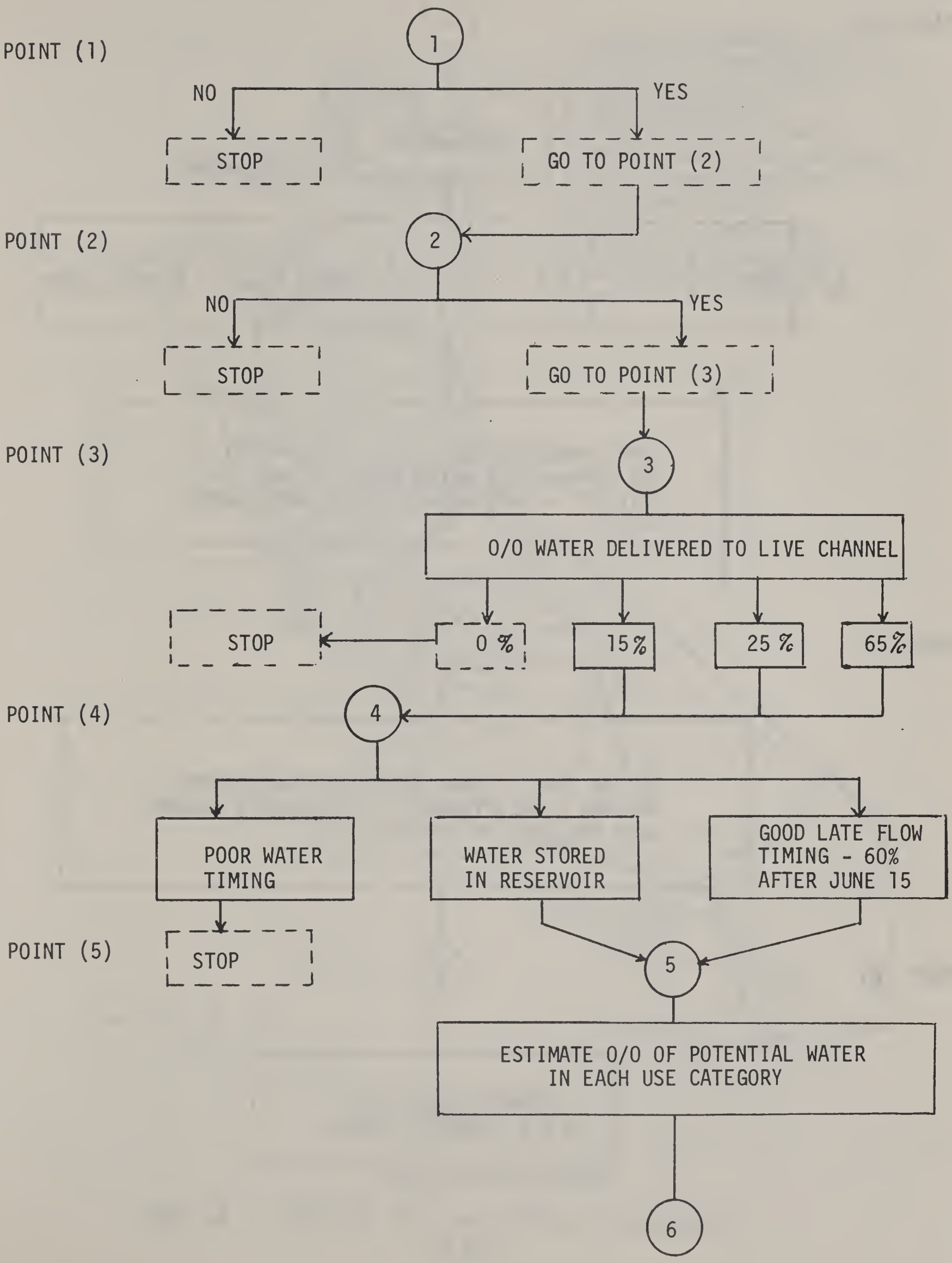
(1 AF/AC ($20/AF)) = $40/AC

However, since the per acre water yield may change each year, depending on the water yield time stream, each year after the type conversion must be adjusted. See time stream section. This can be done for each year and if the total acres per year under the applicable yield rate are multiplied by that rate, the result is total water yield per year. Total yield per year then multiplied by the weighted water value in $/AF gives total water value for that year of water yield.

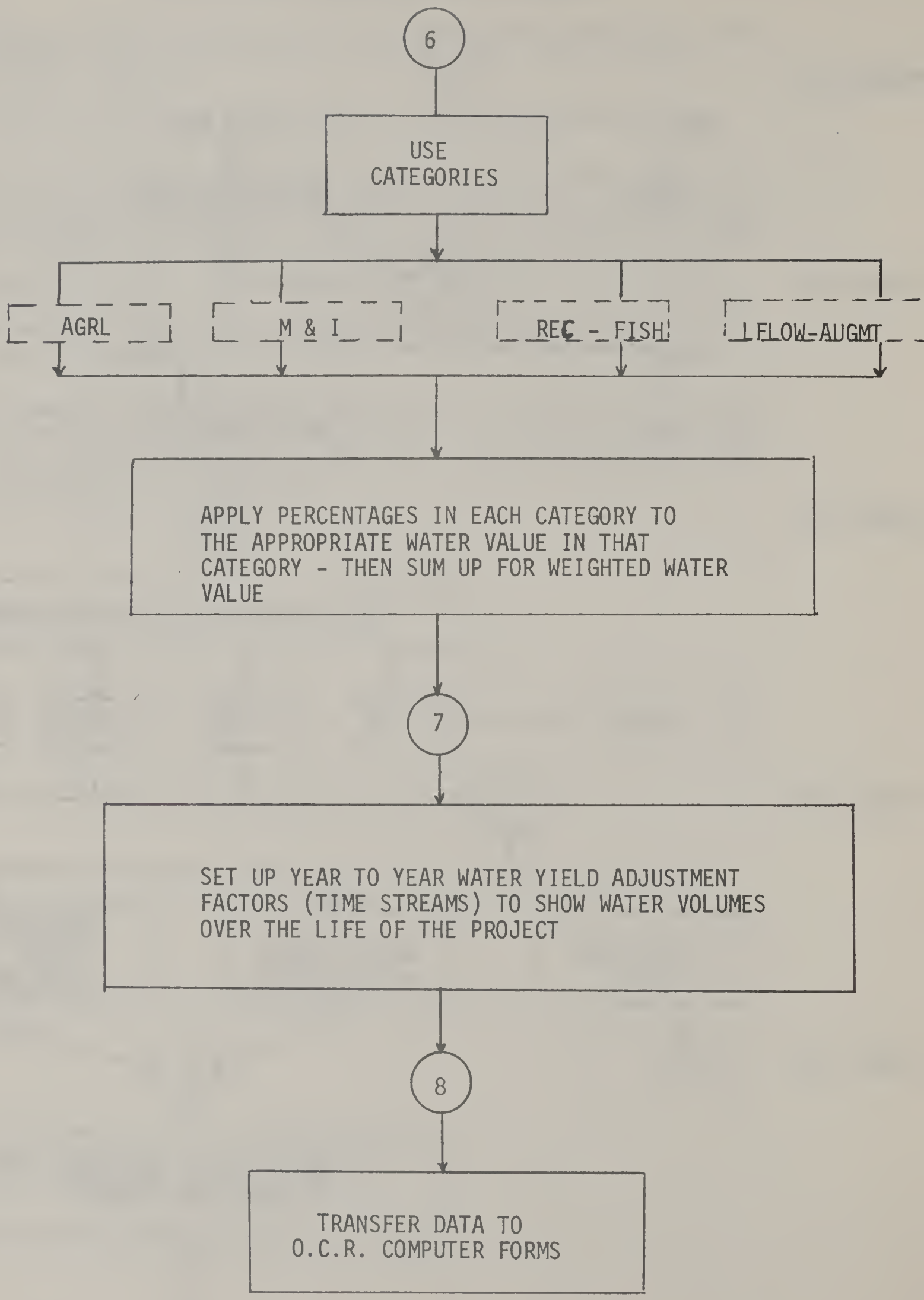
In some cases it is easier to accumulate the total yield from all type conversions by years in table form. This gives a total yield for each year which can be multiplied by one water value if they serve the same water use points.

FIGURE 2

WATER VALUE DECISION CRITERIA DIAGRAM FOR NEW OR ADDITIONAL WATER

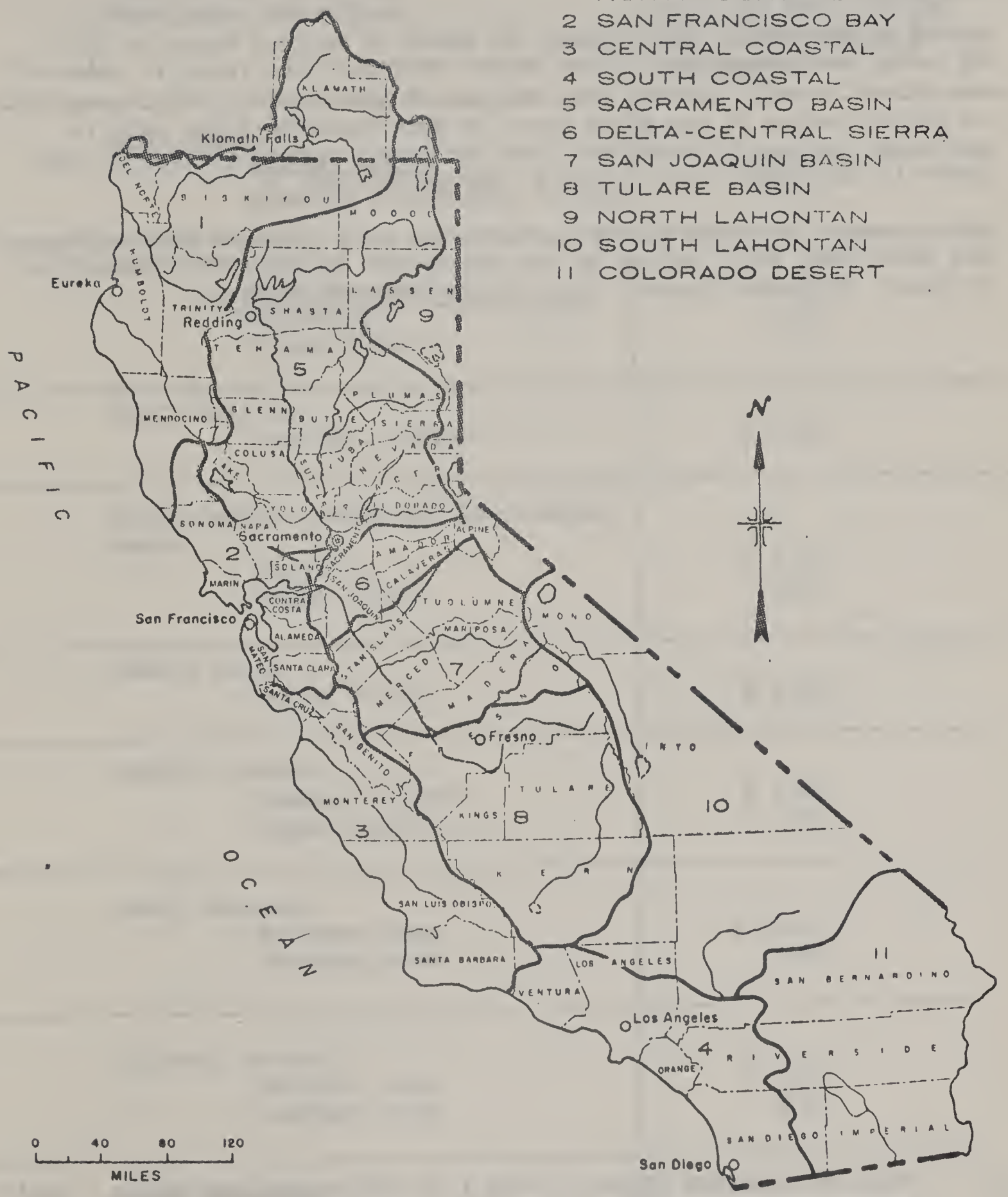


POINT (6)



POINT (7)

POINT (8)



CALIFORNIA REGION

FIG. 3 COUNTIES AND CALIFORNIA SUBREGIONS

WATER VALUE TABLES 1/

The following tables list values for water in various kinds of uses by major use categories. These values represent the relative value of the direct benefit derived from the use of that water. This essentially is its net value in the given use. If more specific local data is available and can be converted into the same economic context as that shown in the value tables, then it should be used.

If the water delivered to the use area has more than one use, multiply the individual water values by the percentage in each use as described in point (6) under Figure 2 Water Value Decision Criteria.

1/ Refer to attached Figure 3, Map 1 of California Subregions - Calif. Comprehensive Framework Study, P.S.I.A., Water Resources Council, 1971.

Table. | Relative Water Values for Irrigation of Field Crops and Vegetables

Water Resource Council Hydrologic Sub-region:	1971 Estimated average net value per acre foot of water delivered at the farm head gate 1/
North Coast:	
Coastal Area	$ 2.35
Interior & High Mtn. Valleys	0.72
Sacramento Basin:	
High Mtn. Valleys	$ 0.28
Foothills	1.52
Valley Floor	1.85
North Lahontan:	
High Mtn. Valleys	$ 0.28
Delta-Central Sierra and San Joaquin Basin:	
Foothills	$ 3.06
Valley Floor	3.22
Tulare Basin:	
Valley Floor	$ 3.34
Central Coastal:	
Coastal Valleys	$ 7.23
Inland Valleys	5.59
South Coastal:	
Northern Area	$ 10.53
Southern Area	9.00
Colorado Desert:	
Northern Area	$ 3.42
Southern Area	3.77
South Lahontan:	
Valley Areas	$ 1.01

1/ Estimated on basis of final outputs (major crops), market prices, production costs, land productivity, water consumption, and climate as of 1965 with costs and values updated to 1971.

Water Values by California Subregions - Municipal and Industrial Water (M & L) - $/AF [1]

SR-1 [1] North Costal		$/AF
Coastal Area		
	Cresent City	120
	Eureka	61
	Arcata	71
	Fortuna	92
	Gasquet	187
		Ave. $106
Interior and High Mountain Valleys		
	Yreka	230
	Happy Camp	134
	Meadow Brook Acres	281
	Butte Valley	
	In. Dist.	120
	Ukiah	26*
		Ave. $157

1/ American Water Works Assoc. 1968, and E.R.S. Studies 1971.

* Water taxes not included.

2/ SR-1 = Subregion No. 1. See map 1 (Figure 3)

SR-2 San Francisco Bay	$/AF
Coast&Valleys	
Alameda Co. W. Dist.	104
Burlingame	105
Campbell	60
E. Bay M.W. Dist.	68
Palo Alto	105
Redwood City	110
San Gabriel	44
San Francisco	89
Tracy	33
	Ave. $ 80
Interior Valley and Foothills	
Tracy	34
Santa Rosa	83
	Ave. $ 58
High Mt. Valleys	
(not applicable)	

SR-3 Central Coastal	$/AF
Coast & Valleys	
Monterey	123
Santa Cruz	59
Santa Barbara	76
Santa Paula	50
	Ave. $ 77
Foothills (see others)	
High Mt. Valleys (see others)	

SR-4 South Coastal	$/AF
Coast	
Alhambra	51
Anaheim	57
Arcadia	54
Beverly Hills	51
Burbank	51
Chula Vista	121
Compton	35
Coronado	144
Fullerton	48
Glendale	68 (Local) 115 (imported)
Hawthorne	73
Huntington Park	65
Inglewood	66

South Coastal Cont'd.	$/AF
Lakewood	62
Long Beach	67
Los Angeles	62
Oxnard	76
Pasadena	72
Ponoma	31
San Bernardino	51
San Diego (untreated)	32
(treated)	42
Santa Ana	46
Santa Monica	61
South Gate	32
Ventura	81
Whittier	62
Torrance (Colo. R.)	50
Santee	42
	Ave. $62

Valley Floor - Interior	$/AF
El Centro	44
Monrovia	46
	Ave. $45
High Mt. Valley	43

SR-5 Sacramento Basin	$/AF
Valley Floor - Interior Sacramento	52
Foothills	108
High Mt. Valleys	65

SR-6 Delta - Central Sierra (see others)

SR-8 Tulare Basin	$/AF
Valley Floor	
Hanford	47
Fresno	29
Tulare	34
	Ave. $37
Foothills (see others)	
High Mt. Valleys (see others)	

SR-7 San Joaquin Basin	$/AF
Valley Floor - Interior	
Merced	39
Modesto	35
	Ave. $37
Foothills (see others)	
High Mt. Valleys (see others)	

SR-9 North Lahontan	$/AF
Valley Floor (see others)	
Foothills (see others)	
High Mt. Valleys	$65

SR-10 South Lahontan	$/AF
Valley Floor (see others)	
Foothills (see others)	
High Mt. Valleys	$65

SR-11 Colorado Desert	$/AF
Valley Floor (see others)	
Foothills (see others)	
High Mt. Valleys	$65

7. FLOODING

Flood Damages or Impacts - Critical Events

The amount and extent of damage caused by any flood depends on the topography of the area flooded, depth and duration of flooding, velocity of flow, and the developments in the flood plain.

The relative loss due to flooding depends on the financial and social values of the areas affected by the on-site and downstream flooding.

The magnitude of the flood peak, duration of flood flow and volume, is related to the freequency of occurence for the climatic event initiating the flood, the hydrologic characteristics and condition of the watershed, and the hydraulic geometry and condition of the channel and flood plain.

Stratifying and Grouping Flood Hazards Potentials

Damages from existing flooding patterns and the predicted potentials for increases or decreases in damages due to management activities, wildfire, or natural climatic events should be stated in terms of values lost. This value may be a combination of on-site and downstream (off the forest) impacts. One indicator of relative damage value is in dollar pre acre foot of flood flow ($/AF) or dollars per cubic foot per second of peak flow ($/c.f.s.) for a given flood occurrence frequency or defined flood condition. If flooding is described in terms of volume or peak flow only, then two floods with the same peaks or volumes, but with tremendously different damage potential, could be erroneously combined or grouped together. This would not give useful information to the resource manager for comparing resource alternatives, tradeoffs, and opportunity costs.

If the damage figures are divided by the square miles 1/ of watershed area above the place where the flow estimate for the defined reach was taken, then stratifying and grouping existing and potential flood damage values can become a useful part of the data and information used in resource management.

1/ In some cases it may be more meaningful or necessary to divide dollars per acre foot or dollars per c.f.s. flood damage by acres instead of square miles.

In order to use the damage tables presented here for determining the relative difference between project or program alternatives, the user must:

1 - Determine the average annual peak discharge for the entire river basin.

2 - Assume the average annual damage is primarily related to annual average peak discharge.

3 - Relate the average annual peak discharge from the project area to the whole basin as a proportion of the average annual peak discharge.

4 - Assign a portion of the damage to the project area based on the relationship developed in Step 3.

5 - Any management act that changes the annual average peak discharge from the project area over a future time frame will also change the amount of average annual damages assigned to the project area. The change caused by the project or program implementation can be treated as a "ballpark" estimate of the relative benefits attributable to the project.

As a relative indicator or index of flood damage the following expected flood plain damages can be useful for project evaluation. Projected future damages are considered to be a function of the level of economic development. Degrees of economic development vary from area to area and the damage projections for the various areas reflect these different assumed growth rates. 1/

Water resource Council Subregion & River Basin	2&3/ Estimated Average Annual Flood Damage ($1,000) 1965 Econ. Conditions	1980 Econ. Conditions	2000 Econ. Conditions
North Coastal Subregion:		(511) 3/	(580)
1. Klamath River upstream of Hornbrook	$ 891 2/	1,234 2/	2,251
		(3,366)	(3,673)
2. Klamath River downstream of Hornbrook	3,259	3,919	5,555
		(1,035)	
3. Smith River Basin	857	1,035	1,368 (968)
		(1,432)	
4. Trinity River Basin	1,213	1,432	2,118 (928)
		(12)	
5. Redwood Cr. Stream Gr.	249	361	768 (23)
		(252)	
6. Mad River Basin	505	644	1,117 (362)
		(3,559)	
7. Eel River Stream Gr.	3,492	4,708	8,798 (2,414)
		(339)	
8. North Coastal Stream Group	245	339	607 (585)

1/ Data from Tables 5&8 - Comprehensive Framework Study - California Region - Appendix IX - Flood Control - 1971 (in 1965 prices).

2/ Estimate of Present & Future conditions of economic development based on 1965 Flood Control Measures - figures do not include the damage to reservoirs from sedimentation.

3/ Figures in parenthesis show estimated damages if the WRC proposed flood program for 1966 thru 1980 and 1981 thru 2000 are implemented - figures do not include the damage to reservoirs from sedimintation.

SUBREGION AND BASIN	ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE ($1,000)		
	1965 Economic Condition	1980 Economic Condition	2000 Economic Condition
Central Coastal Subregion			
1-Santa Cruz Stream Group	193	(39) 421	(80) 992
2-Pajaro River Basin	2103	(1506) 2763	(1968) 4784
3-Salinas River Basin	3613	(4159) 4416	(2949) 6592
4-Carmel River Group	685	(1353) 1353	(600) 3715
5-Morro-San Simion Stream	296	(445) 470	(540) 880
6-San Luis Obispo-Arrogo Grande Streams	270	(265) 480	(235) 995
7-Santa Maria River Basins	728	(952) 1107	(814) 1640
8-Santa Ynez River Basin	604	(409) 1018	(540) 1807
9-Santa Barbara Streams	1512	(1495) 2731	(1545) 5101
South Coastal Subregion			
1-Ventura River Basin	346	(297) 450	(305) 790
2-Santa Clara River Basin	2068	(1856) 3625	(2025) 8760
3-Calleguas Cr. Basin	1105	(1050) 2168	(722) 4690
4- Malibu Coastal Stream	144	(260) 280	(165) 500
5-Santa Monica Bay Stream	1255	(1175) 1865	(980) 3040
6-Los Angeles River Basin	1546	(1384) 2200	(1020) 3450
7-San Gabriel River Basin	1665	(1505) 2250	(750) 3255

SUBREGION AND BASIN	ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE ($1,000)		
	1965 Economic Condition	1980 Economic Condition	2000 Economic Condition
8-Santa Ana River Basin	9475	(8385) 18,800	(7297) 43,285
9-Orange County Streams	148	(249) 253	(245) 440
10-Santa Margarita River	790	(1067) 1140	(733) 2270
11-San Luis Ray River	929	(995) 1720	(745) 3365
12-San Dieguito River	663	(799) 1070	(1051) 1965
13-San Diego River	1184	(321) 2335	(322) 4665
14-Sweetwater River	248	(174) 540	(245) 1230
15-Otay-Tijuana River	144	(127) 260	(210) 535
Sacramento Basin Subregion			
1-Sacramento River Basin above Shasta Dam	1593	(1677) 2331	(2008) 3669
2-Sacramento River-Shasta Dam to Sacramento	716	(833) 1127	(1500) 2444
3-Redding Stream Group	626	(625) 1003	(621) 2129
4-Middle Sacramento River Tributaries-Eastside	271	(344) 399	(106) 690
5-Middle Sacramento River Tributaries-Westside	389	(115) 606	(139) 1153
6-Stony Creek Basin	303	(357) 358	(488) 491
7-Colusa Basin and Tributary Streams	674	(764) 967	(798) 1498
8-Butte Basin and Tributary Streams	841	(1082) 1352	(1019) 2042
9-Feather River Basin	3117	(982) 4725	(1306) 8675

SUBREGION AND BASIN	ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE ($1,000)		
	1965 Economic Condition	1980 Economic Condition	2000 Economic Condition
10-Yuba River Basin	706	(472) 1002	(573) 1791
11-Bear River Basin	1529	(2283) 2285	(401) 3998
12-Coon Creek Streams	233	(118) 408	(48) 531
13-American River Basin	1794	(1677) 2782	(2239) 5359
14-Cache Creek Basin	550	(827) 1117	(198) 2756
15-Putah Creek Basin	134	(56) 228	(91) 449
16-Morrison Creek Stream Group	125	(28) 218	(60) 469
17-Project Bypass in Sacramento Basin	4	(6) 6	(14) 14
Delta-Central Sierra Subregion			
1-Cosumnes River	717	(231) 934	(291) 1399
2-Mokelumne River	276	(332) 342	(283) 519
3-Stockton Area Streams	355	(112) 560	(242) 1320
4-Westside Stream Group-Delta Central Sierra	227	(315) 317	(380) 540
5-Delta Islands	2150	(1123) 2946	(1413) 5840
6-Cache Slough and Tributaries	841	(1013) 1013	(1246) 1657
7-Sacramento Deep Water Ship Canal & Project Bypass	285	(311) 311	(395) 395
8-Sacramento River below Sacramento	856	(1443) 1443	(1748) 3107

SUBREGION AND BASIN	ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE ($1,000)		
	1965 Economic Condition	1980 Economic Condition	2000 Economic Condition
South Lahontan Subregion			
1-Mojave River	654	(454) 1200	(740) 3350
2-Antelope Valley	3206	(4405) 6290	(3600) 11,320
3-Searless Lake	862	(1020) 1300	(1405) 3030
4-Amargosa River-Ivanpah Valley-Deep Springs Basin	1249	(1435) 1470	(2225) 2400
5-Owens Valley	1146	(1865) 2165	(2010) 3600
6-Mono Lake Adobe	206	(225) 230	(279) 300
Colorado Desert Subregion			
1-Mojave Desert Group	156	(305) 370	(608) 1240
2-Whitewater River Basin	1482	(1317) 2652	(925) 6450
3-Salton Sea Group	5692	(7685) 8320	(7125) 12,710
4-Colorado River Drainage	3545	(3635) 5400	(4455) 8800
San Joaquin Basin Subregion			
1-Stanislaus River	365	(81) 590	(151) 1232
2-Tuolumne River	383	(180) 604	(285) 1212
3-Merced River	450	(354) 737	(425) 1293
4-Merced County Stream Group	618	(238) 1190	(228) 2655
5-Madera County Stream Group	882	(82) 1637	(342) 3952

SUBREGION AND BASIN	ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE ($1,000)		
	1965 Economic Condition	1980 Economic Condition	2000 Economic Condition
6-San Joaquin River	1091	(1439) 1191	(1030) 3922
7-Westside Stream Group San Joaquin Basin	103	(64) 178	(130) 391
Tulare Basin Subregion			
1-Fresno County Stream Group	541	(754) 1051	(290) 2543
2-Kings River Basin	672	(922) 956	(1175) 1394
3-Kaweah River	1256	(1414) 1888	(2006) 2790
4-Tule River	661	(949) 949	(1522) 1522
5-Poso Creek Stream Group	1018	(1562) 1562	(1584) 2629
6-Kern River	2632	(3306) 3342	(3815) 4469
7-Caliente Creek Basin	1162	(1483) 1952	(2495) 4135
8-Stream Tributary to Buena Vista Lake	169	(238) 242	(326) 348
9-Westside Stream Group Tulare Basin	991	(1595) 1697	(96) 3098
10-Tulare Lake Bed	364	(470) 576	(556) 806
North Lahontan Subregion			
1-Surprise Valley	455	(295) 568	(237) 805
2-Susan River	331	(385) 445	(405) 698
3-Truckee River	827	(1262) 1372	(714) 2851
4-Carson River	19	(31) 31	(65) 79
5-Walker River	406	(431) 542	(519) 908

8. Fire Suppression and Control

The objective of the fire control evaluation is to determine the magnitude of savings in fire suppression costs and resource damage that may be expected from a particular project or policy. Fire losses over a future period of time should be calculated on the basis of what would have occurred in the way of impacts and resource use if the fire occurred without the project or policy as compared to what would likely be the impacts and resource use if the fire occurs with the project or policy.

Resource loss values and benefits should be calculated for:

1. Timber growth impact damage - Actual timber value lost, due to fire damage (lost volume plus reduced market price). (See Section on Wood Fibre values).

2. Recreation use foregone because of fire damage to recreation facilities. (See Section on Recreation and Wildlife values).

3. Residential or Recreation home-use foregone because of fire damage. (See section on Residential and Recreation Homes)

4. Sedimentation effects on-site and off-site. (See section on Sedimentation Values)

5. Structural damage to bridges and roads, airfields, lookout towers, etc. (See section on Structural Damage Other Than Homes and Outdoor Recreation Facilities.)

6. Range and Wildlife use foregone. (See section on Forage and section on Recreation and Wildlife Values.)

7. Commercial Enterprises loss. (See section on Damages to Commercial Enterprises.)

8. Flood damages. (See section titled Sedimentation Reduction or Prevention and Flooding.)

9. Water Yield. (See section on Water Values.)

Fire costs can be approximated by using the fire cost charts.

SUPPRESSION COST

CHART I
NORTH ZONE FORESTS

95% OF SUPPRESSION COST PER ACRE FELL WITHIN UPPER AND LOWER LIMITS.

DOLLARS PER ACRE

SUPPRESSION COSTS

350
300
250
200
150
100
50

UPPER LIMIT

AVERAGE COST PER ACRE

LOWER LIMIT

0 4 10 — 100 — 1000 — 10,000 — 100,000

SIZE OF FIRE — ACRES

10.01

SUPPRESSION COST

CHART II
SOUTH ZONE FORESTS

95% OF SUPPRESSION COST PER ACRE FELL WITHIN UPPER AND LOWER LIMITS.

SUPPRESSION COSTS DOLLARS PER ACRE

350
300
250
200
150
100
50

UPPER LIMIT

AVERAGE SUPPRESSION COST / ACRE

LOWER LIMIT

0 5 10 100 1000 10,000 100,00

SIZE OF FIRE — ACRES

9. Damages to Commercial Enterprises

Damages to commercial enterprises from fires and floods can result from:

a. Loss of value added before income tax (sales minus cost of goods purchased). This would indicate the effects on National Economic Development; and

b. Structural damage:

(1) If gross annual sales information is available, the following table showig the typical operating ratios (in terms of percent) can be applied to the gross sales figure to approximate net value added before taxes. Net value added, divided by the number of operating days will provide average daily value added. The average daily value added figure multiplied by the number of days the enterprise is closed down due to fire or flood will provide a rough estimate of the damages in terms of loss of value added before taxes.

(2) For structural damage, use the same procedure as described in the section on Structural Damage Other Than Homes and Outdoor Recreation Facilities. The average normal life of commercial structures (buildings) is 45 to 50 years.

Damages To Commercial Enterprises

(Est. % Value Added) 1/

Enterprise	Annual Gross Sales (1964 Prices)	% Value Added		Annual Gross Sales (1964 Prices)	% Value Added		Annual Gross Sales	% Value Added	
		1964	1971		1964	1971		1964	1971
Appliances & Radio - TV Dealers	above $500,000	24%		$250,000 to $500,000	25%	37%	Below $250,000	30%	46%
Automobile Dealers	under $300,000	15%	16%	over $300,000		15%			
Used Cars	$50,000 to $200,000	15%	19%						
Auto Parts Dealers	$50,000 to $200,000	36%	41%						
Bakeries	under $25,000	52%	53%	$25,000 to $50,000	53%	54%	$50,000 to $100,000	53%	55%
Barber & Beauty Shops	combined and under $50,000	88%		Beauty shops above					
Beauty Shops	All sizes	88%							
Book Stores	under $50,000	39%		over $50,000	35%				
Children's & Infant's Wear	under $50,000	32%	40%	$50,000 to $100,000	33%		over $100,000	34%	
Cocktail Lounges	under $25,000	43%	47%	$25,000 to $50,000	45%	47%	$50,000 to $100,000	42%	47%
Confectionery Stores	under $100,000	37%	42%						
Department Stores	1 million to 5 million	34%		5 million to 20 million	33%		over 20 million	35%	

Damages To Commercial Enterprises

(Est. % Value Added) 1/

Enterprise	Annual Gross Sales (1964 Prices)	% Value Added		Annual Gross Sales (1964 Prices)	% Value Added		Annual Gross Sales (1964 Prices)	% Value Added	
		1964	1971		1964	1971		1964	1971
Dry Cleaners	Under $25,000			$25,000 to $80,000			Over $80,000		
Dry Goods & General Merchandise	Under $50,000	29%		$50,000 to $200,000	30%		$200,000 and over	31%	
Drug Stores(Retail Pharmacies	Under $50,000	38%	38%	$40,000 to $60,000	38%	38%	Over $70,000	38%	
Florists	Under $30,000	53%		$30,000 to $70,000	56%		Over $70,000	57%	
Furniture Stores	Under $100,000	39%	41%	$500,000 to 1 million	38%	40%	Over 1 million	38%	40%
Garages	Under $25,000	54%	57%	$25,000 to $50,000	49%	54%	$50,000 to $100,000	47%	54%
Gift, Novelty & Souvenir	Under $25,000	40%		$25,000 to $50,000	40%		Over $50,000	40%	
Grocery Stores	Under $50,000	16%		$50,000 to $100,000	17%		$100,000 to $200,000	17%	
Super Markets	Under $100,000		17%	$100,000 to $500,000		18%	Over $500,000	20%	18%
Hardware	$50,000 to $200,000	33%	36%						

Damages To Commercial Enterprises

(Est. % Value Added) 1/

Enterprise	Annual Gross Sales (1964 Prices)	% Value Added		Annual Gross Sales (1964 Prices)	% Value Added		Annual Gross Sales (1964 Prices)	% Value Added	
		1964	1971		1964	1971		1964	1971
Jewelry	Under $30,000	51%		$30,000 to	48%		$100,000 to $300,000	43%	
							over $300,000	45%	
Liquor Store	Under $50,000	23%	27.5	$50,000 to $100,000	24%	28.5%	$100,000 to $200,000	25%	30%
Lumber & Building Materials	$50,000 to	31%	34%						
Meat Markets	$50,000 to	21%	23%						
Men's Wear	Under $100,000	34%	38%	$100,000 to $500,000	35%	39%	$500,000 and over	36%	40%
Motels	1 to 10 units	60%		11 to 20 units	56%		21 to 40 units	51%	
							over 40 units		
Music Stores	25,000 to 50,000	40%							
Nursery & Garden Supply Stores	25,000 to 50,000	36%							
Office Supply & Equip. Dealers. (Stationery Stores		36%							
Restaurants	Under 50,000		52%	50,000 to 100,0 100,000		52%	100,000 to 200,000.		54%

11.03

Damages To Commercial Enterprises

(Est. % Value Added) 1/

Enterprise	Annual Gross Sales (1964 Prices)	% Value Added		Annual Gross Sales (1964 Prices)	% Value Added		Annual Gross Sales (1964 Prices)	% Value Added	
		1964	1971		1964	1971		1964	1971
Service Stations	Under 50,000	22%	27%	50,000 to 100,000	22%	28%	100,000 to 200,000	23%	27%
Shoe Stores	Under $50,000	36%	43%	50,000 to 100,000	35%	42%	100,000 to 150,000	36%	43%
Sporting Goods	Under $75,000	34%		75,000 to 500,000	28%		Over 500,000	29%	
Taverns	Under $50,000	44%	48%	50,000 to 100,000	43%	47%	100,000 to 200,000	43%	47%
Toy Stores	60,000 or less	35%		over 60,000	36%				
Variety Store	25,000 to 50,000	36%							

1-04

1/ References: (Data used to derive Est.)

1 - National Appliance & Radio - TV Dealers Association, Chicago, Illinois
2 - Modern Beauty Shop Magazine, Chicago, Illinois
3 - American Booksellers Association, New York, N. Y.
4 - Dun & Bradstreet Incorporated, New York, N. Y.
5 - National Retail Merchants Association, New York, N. Y.
6 - National Institute of Dry Cleaning, Silver Spring, Maryland
7 - Management Counseling Services - The National Cash Register Co. - Dayton, Ohio
8 - Annual Lilly Digest - Eli Lilly & Co., Indianapolis, Indiana
9 - Barometer of Small Business - Accounting Corp. of America, San Diego, California
10 - Super Market Institute Inc., Chicago, Illinois
11 - The National Retail Hardware Association, Indianapolis, Indiana

12. Retail Jewelers of America, Inc., Washington, D. C.

13. Dealers Operating Results - National Stationery and Office Equipment Association, Washington, D. C.

14. National Sporting Goods Association, Chicago, Illinois

10. Value of Residential & Recreation Homes

A. Value of Recreation Homes (second homes): In the Wester Census Region the Median Number of Rooms is 3.4 and Estimated Median Market value is $7,400 in 1967 prices. 1/

VALUE OF PROPERTY

	Percent Distribution
Less than $5,000	33.3
$5,000 to $9,999	35.2
$10,000 to $14,999	6.8
$15,000 to $19,999	6.0
$20,000 or more	18.7
Median value (Estimated Selling price 1967)	$7,400

ROOMS

1 and 2 rooms	27.2
3 and 4 rooms	51.3
5 rooms or more	21.5
Median number of rooms	3.4

Local real estate offices can be of assistance in determining recreation home values.

1/ Housing Report H121-No. 16 - Second Homes in the United States - U. S. Depts. of Commerce & U. S. Dept. of Agriculture, June 1969.

B. Residential Homes:

The median value of homes in various localities can be approximated by using the following references for the areas nearest the project being evaluated.

1. The 1970 Housing Census Report for California - Series HC(L)-A "General Housing Characteristics" contain information on the value of homes for:

1 - Financial Characteristics of Places of 50,000 Inhabitants or more - Table 10

2 - Financial characteristics of Places of 10,000 50,000 Inhabitants - Table 20

3 - Financial Characteristics of places of 2,500 to 10,000 Inhabitants - Table 24

4 - Selected Characteristics of Places of 1,000 to 2,500 Inhabitants - Table 27

2. Local Real Estate Offices and Realtors can provide valuable information.

C.

The value of the damage should be prorated over the estimated remaining life of the structures prior to the assumed damage from fire. This last step is designed to develop a minimum proxy value of service or benefits foregone overtime due to the physical damage of the structure and contents. The estimated useful life and proration should be made as follows:

Assume remaining useful life is 10 years, damage from fire is 20% or $2,000 per structure, and there are 10 structures damaged.

Total damage = $20,000
Prorate $20,000 over 10 years = $2,000 per year

The normal useful life of dwellings is 40 years.

In addition to structural damage, there usually is evacuation costs associated with fires and floods, including transportation and temporary quarters during the conflagration or disaster.

Use $25 per day per person for the cost of temporary quarters and evacuation costs. Present of the population evacuating a particular area should be based on experience and actual fire history for similar situations.

11. Structural Damage Other Than Homes and Outdoor Recreation Facilities

Structural dmage to bridges, roads, airfields, lookout towers, range fences, etc.

Damage should be based on replacement cost to the same standard prior to the fire, if in fact the improvements would be repaired or reconstructed. The cost should be prorated over the future years of the remaining useful life of the improvements prior to the fire.

12. MINERAL - MINERAL FUELS, METALS AND NON-METALS

Market values exist for most minerals; however, they are subject to periods of considerable fluctuation. The major problem in characterizing their values at a given area or site appears to be in determining how much is really there, what is the overall quality of the deposit or field, how much is accessible, and how do the extraction and transportation costs affect its economic status. Each mineral has its own basic economic characteristics and the location of the deposit or field may determine whether its existing value is of regional or national importance. Information on the existing and projected demand for a mineral is very important. It can give an indication as to what kind of increase or decrease in activity one can expect, and also insight as to when it might occur. This is particularly useful for long range resource planning and five year program planning. Sources for this type of information include the "Mineral Resources) appendix of the River Basin Comprehensive Framework Studies done on a regional basis, and the U.S. Department of Interior, Bureau of Mines Bulletin 650 "Mineral Facts and Problems" published in 1970. These studies discuss mineral supply, demand, and values as well as give an overall economic summary.

Minerals have been grouped a number of ways. Technically they have been described as:

1. The Energy Group
   These include conventional fossil fuels - petroleum, coal, natural gas the new fissile fuels including uranium perhaps thorium.

2. The Ferrous Group
   Iron predominates the field which also includes manganese, silicon, chromium, nickel, cobalt, columbium, tungsten, tantalum, molybdenum, vanadium, etc.

3. The Nonferrous Group
   These range from aluminum, copper, lead, zinc, mercury, magnesium and titanium which are primarily industrial, to the precious minerals - gold, silver and platinum.

4. The Nonmetalic Group
   These cover a large spectrum which includes bulky commodities such as sand and gravel to industrial demands and gem stones in relatively small quantities.

MINING TERMS USED TO DESCRIBE MINERAL DEPOSITS

Mining terms peculiar to the mineral industry that are used in this section are defined as follows:

Mineral Resource. A mineral deposit becomes a resource when its existence is recognized and its character is known to the extent that it may have present or future utility. Inference may be based upon geological deduction, projection of historical and statistical data, or some other rational method.

Mineral Reserve. A mineral resource becomes a reserve when some knowledge of its quantity and quality is established. As better knowledge of the deposit is developed, the reserve may be classed as measured, indicated, or inferred.

Measured Reserve. A reserve for which tonnage is computed from dimensions revealed in outcrops, trenches, workings, and drill holes and for which the grade is computed from the results of detailed sampling. The sites for inspection, sampling, and measurement are so closely spaced and the geologic character is so well defined that the size, shape, and mineral content are well established. The computed tonnage and grade are judged to be accurate within stated limits, and no such limit is judged to differ from the computed tonnage or grade by more than 20 percent.

Indicated Reserve. An indicated reserve is one for which tonnage and grade are computed partly from specific measurements, samples, or production data and partly from projections for a reasonable distance on geologic evidence. The sites available for inspection, measurement, and sampling are too widely or otherwise inappropriately spaced to outline the ore completely or to establish its grade throughout.

Inferred Reserve. An inferred reserve is one for which quantitative estimates are based largely on broad knowledge of the geologic character of the deposit and for which there are few, if any, samples or measurements. The estimates are based on an assumed continuity or repetition for which there is geologic evidence; this evidence may include comparison with deposits of similar type. Ore bodies that are completely concealed may be included if there is specific geologic evidence of their presence.

Oil Reserve. No universally accepted meaning for the term "oil reserve" has been established. Those features which are most commonly accepted as narrowing its meaning are (1) Proved oil--proved by geological and engineering information to a high degree of probability; (2) Recoverable --that portion of the underground oil that can be withdrawn by using methods recognized in the present state of technology; and (3) Commercial--producible profitably at today's prices, operating costs, and conditions. The American Petroleum Institute (API) defines "proved reserves" as "the estimated quantities of crude oil which geological and engineering data demonstrate with reasonable certainty to be recoverable from known reservoirs under existing economic and operating conditions." Included in the "proved" classification are reserves which can only be produced by fluid injection or other improved recovery techniques. Reservoirs are considered proved if their producibility is supported by either actual production or conventional drill stem tests. At best, the determination of oil reserves is an estimate. Unlike ore bodies in mines, petroleum cannot be observed and measured in place.

MINERAL VALUES

Basic Procedure

The basic procedures for deriving a benefit value or expected range in value for a given mineral depends a great deal on how well it can be located and characterized. In some cases we can only say it is inferred that a deposit exists, while in others we may have a measured reserve about which the quantity and quality is well established. If the deposit or reserve is not already being utilized, then the resource manager may have to make some assumptions or set up some probabilities of when demand will induce the area to come into production. This is assuming extraction and transportation costs will be such that it is an economic operation or that increased demand has raised its value sufficiently.

For some types of minerals and mineral associated industries, because of their competitive posture and for national defense reasons, information may be sparse or very hard to get. However, there is usually at least enough available, for a resource manager can gain helpful insight into what ways potential minerals' activities may influence his resource management alternatives.

Starting with the broad categories of mineral fuels, metals and nonmetals (nonmetallic minerals excluding fuels), areas should be first physically stratified and characterized for the quality and quantity of the deposit or reserve. In many cases the degree to which this can be done will vary considerable; however, various stratification and characterizing schemes have been worked out that still provide very useful information (see the examples and definitions that follow in this section).

Metals may have to be described in terms of areas where a mineral environment exists, whereas fuels and nonmetals may be identifiable as definite deposits, beds, or zones with their general quality known.

A very general example outline of physical and economic data needs for characterizing a mineral would appear as follows:

1. Description of Deposit or Reserve.
   - A. Location and boundary in each of the following:
     - (1) Area in measured reserve.
     - (2) Area in indicated reserve.
     - (3) Area in inferred reserve.
2. Basic characteristics of the Reserve.
   - A. Estimated quality of the reserve.
   - B. Quantity of mineral in each quality grouping.
3. Extraction or Depletion of Mineral Body.
   - A. Existing Operations
     - (1) Reported or estimated rate and volume.
   - B. Future Potential Operations.
     - (1) Probabilistic prediction or range in time when operations are expected.
     - (2) Estimated rate and volumes

4. Economic Data
   A. Benefit Values
   B. Cost Values

Deriving Benefit Values

Because of the many variables due to quality, location, etc. the values shown here are averages based on studies made by the Bureau of Mines. More specific values for a given area may be obtained from W.R.C. River Basin Studies and from local market data. In general these values represent what the mineral is worth as an input to production of other goods or at its first initial processing point if it must go through an initial processing stage. Or, it may be the value of the mineral if it is used directly as an output or commodity.

Thses benefit index values should be used as general values to make relative comparisons with other resources that may be produced from the same or nearby areas of land. Tbey may, need to be adjusted for local conditions.

The benefit index value tables contained in this section were set up by the mineral classes used by the U. S. Bureau of Mines, Bulletin 650, published in 1970.

Deriving Cost Values

General cost data, when obtainable, can be expected to vary considerably. This is due in part to the extraction techniques used, location and characteristics of the mineral reserve, and transportation costs to the point at which the benefit index value was developed or derived.

In some cases percentage breakdowns of total costs can be multiplied against the benefit index value and added to get total cost. The average percentage that goes to extraction, initial processing, and transportation if applicable, is sometimes known. If not, figures ranging from 80% to 95% of the benefit index value can be used as a very generalized or relative estimate.

Demand

Demand projection of future mineral needs depend not only on local, regional and national activity levels but with some minerals, international factors are quite important. National information and long-term trends are discussed in the Bureau of Mines Bulletin 650 which is updated ever five years. More localized and regional projections can be found in the Water Resources Council Comprehensive Framework River Basin Studies. These give an overall economic summary as well as a apecific appendix devoted to minerals. Most sources now include a "probabilistic range" of forecast demand for minerals. This information is useful in anticipating shifts or long-term trends in mineral activities as well as to identify factors that may cause them to occur.

TABLE

BENEFIT INDEX VALUES MINERALS 1/
(Nonmetallic Minerals)

MINERALS	Units 2/	BENEFIT INDEX VALUES - $/Unit Ave. 1968	Range + or -	Proj.Yr. 2000	REMARKS
Asbestos - ave.	Ton	$ 86.22	$ 5.00	$ 100.00	Processed at mill
- Long Fibre	Ton	1410		1550.00	Processed at mill
Barium - (Barite)					
- chemical grade	Ton	34.00	10.00	35.00	Refined at mill
- drill grade	Ton	24.00	10.00	30.00	Refined at mill
- average	Ton	26.40	10.00	25.00	Refined at mill
Boron - ave.	Ton	472.70		500.00	Refined at mill
Dry borax	Ton	46.75	15.00		Refined at mill
Dehydro. borax	Ton	97.50	15.00		Refined at mill
Bromine Compounds	Pound	0.28	0.05	0.29	Refined brine
Clays - Fullers Earth	Short Ton	25.10	5.00	26.00	Processed clays
- Kaolin		22.00	20.00	25.00	with mineral costs
- Ball clay		13.25	1.00	13.00	of $1 to $10 per ton.
- Bentomite		9.85	1.00	10.00	
- Fire clay		5.22	1.00	6.00	
- Misc. clay		1.38	1.00	2.00	
Diatomite - Earth	Ton	57.98	15.00	58.00	Mill processed
- Abrasives	Ton	129.00	15.00	130.00	Mill processed
Feldspar - crude	Long Ton	12.40	6.00	12.40	Crude feldspar
- ground	Short Ton	16.00	7.00	16.00	Ground feldspar
Gem Stones	Carat				
- Diamonds	1 Carat	650.00	+1900.00	N.A.	Cut stones
- Transparent minerals	1 Carat	2.00	+50.00	N.A.	Cut stones
- Opaque minerals	10-15 Carat	5.00	+30.00	N.A.	Cut stones
Gypsum	Ton	3.67	2.00	3.70	Crude gypsum

1/ Mineral Facts and Problems, Bureau of Mines Bulletin 650, US Dept. Interior, 1970.
2/ When using tables, units may be for processed minerals or unprocessed ore with varying percentages of ore. Consult remarks section for clarification.

MINERALS	Units[2/]	BENEFIT INDEX VALUES - $/Unit Ave. 1968	Range + or -	Proj.Yr. 2000	REMARKS
Iodine	Pound	1.18	1.00	1.50	Crude iodine from brine processing.
Lithium - compound	Pound	0.92	1.00	1.00	Brine or mill processed spoduman
- metal	Pound	7.50	3.00	12.00	Refined metal
Peralite	Short Ton	9.87	1.50	10.00	Crude processed peralite
Potassium - muriate	Short Ton	26.51	5.00	42.00	Standard muriate 60% H_2O
- all grades	Short Ton	33.50	5.00	48.00	All grades processed with $13 to $18/ton mining and processing cost at 14% to 18% ore.
Pumice					
- all grades	Ton	1.58	0.60	1.20	Crude pumice at mine
- aggregate & abrasives	Ton	2.04	+2.00	2.30	Processed pumice
Sand & Gravel					
- common constr.	Ton	1.04	0.50	1.35	Processed
- Industrial sand	Ton	7.87	3.00	10.00	Processed
Sodium	Ton	18.57	3.00	18.57	Sodium chlordie, carbonate and sulfate processed salts
Stone	Ton				
- dimension stone		42.50	2.00	44.00	Mine processed
- crushed & broken	Ton	1.70	0.50	1.75	Mine processed
Strontium					
- compounds	Ton	49.00	20.00	80.00	Pure processed from celesite or strontiumite 56% to 70% strontium
Sulfur	Long Ton	42.00	-10.00	38.00	Processed at gulf ports
Talc, Soapstone & Pyrophylite	Ton	7.00	+3.50	7.00	Crude
↓	Ton	26.00	+70.00	26.00	Processed

TABLE

BENEFIT INDEX VALUES
(Energy Resources-Mineral Fuels)

MINERALS	Units[2/]	BENEFIT INDEX VALUES - $/Unit Ave. 1968	Range + or -	Proj.Yr. 2000	REMARKS
		$	$	$	
Coal					
- anthracite	Ton	8.48	3.00	12.40	At producing facilities (mine)
- bitremenous	Ton	4.67	3.00	4.25	" " " "
Natural Gas	1000 C.F.	0.35	0.10	0.52	At the well head
Peat	Short Ton	11.68	2.00	21.00	At producing plant
Petroleum					
- crude oil	Barrel	2.94	0.30	3.00	At the well head
- natural gas liquid	Barrel	2.04	0.30	2.20	At processing plant
- shale oil	Barrel	3.00	0.20	3.00	At initial refining point
Thorium	Pound				
- manazite sand	Long Ton	190.00	10.00	N.A.	At the mill
- thorium metal	Pound	15.00		N.A.	Thorium processed
- thorium nitrate	Pound	2.75	.50	N.A.	" "
- thorium hardner (pure)	Pound	6.82	2.00	3.40	" "
Uranium					
- oxide (refined)	Pound	9.43	2.00	20.00	Processed at the mill
(FERROUS MINERALS)					
Chromium	Short Ton				
- chromite ore		53.00	10.00	64.00	At distribution point
Iron ore - (51%)	Long Ton	10.21	1.00	12.50	At the mine
- ore 100%	Short Ton	15.40	1.00	17.75	" " " concentrated
Tungsten	Short Ton	43.00	10.00	58.00	Concentrated
	Pound	2.71	0.60	3.91	Concentrated

TABLE

BENEFIT INDEX VALUES
(NONFERROUS MINERALS)

MINERALS	Units[2/]	BENEFIT INDEX VALUES - $/Unit Ave. 1968	Range + or -	Proj.Yr. 2000	REMARKS
Aluminum	Ton	$ 5.00	$ 7.50	$ 10.00	Bauxite at mine
	Ton	50.00	65.00		Processed
Arsenic	Pound	0.08	0.01	0.09	Refined white arsenic
	Ton	69.00	3.50	78.00	Crude white arsenic
Copper	Pound	.42	0.10	7.5	Refined from 0.6% to 0.5% ore.
Gold	Troy oz.	39.26	5.00	50.00	Refined Gold
Lead	Pound	0.13	0.03	0.11	Refined
Magnesium	Ton	74.00	4.00	75.00	Dead burned dolomite
	Pound	0.35	0.05	0.30	Processed metal
Mercury	Flask (approx 85 lbs)	535.00	200.00	630.00	Refined with 4.1 to 7.2 lbs/ton
Platinum	Troy oz.	120.00	5.00	175.00	Refined at 1 oz. per 35 tons of prime copper
Silver	Troy oz.	2.14	0.40	2.50	4.8 oz. of refined sites per ton of ore or
Zinc	Pound	0.13	0.05	0.27	Refine zinc from about 4.0% per ton of ore

13. Esthetics - Natural Beauty

Values related to esthetics or natural beauty can be characterized and analyzed by a combination of techniques. These include the use of a set or scheme of relatively comparative numerical ratings that are based on descriptive criteria that indicate the quality differences in the value of esthetics. In addition, nondescriptive numerical values can be derived that either represent the approximate real market value for the level of esthetic quality in that locality, or the value can be approximated through several indirect (implicit) approaches. These approaches may include: (1) the value of other resources foregone to preserve and maintain the quality of the area, (2) the cost of replacement of such a resource if it is replaceable (3) the required annual equivalent preservation value needed to equal or exceed the present worth value of benefits that would be derived by a development alternative in the area classified as an irreplaceable natural resource or a resource with few equal substitutes, and (4) the value the public has indicated it is "willing to pay" for that quality of a resource or for the preservation of it. Depending on the nature and setting of the area either the direct, the indirect, or a combination of the methods can be used to derive meaningful ranges of esthetic value for a resource. These can be used to make relative comparisons and for aggregations with other resource values.

SCENIC & ESTHETIC VALUES

PROCEDURES & CRITERIA

I. Purpose and Objectives

A. The landscape management procedures and criteria were developed for use in all three levels of resource program planning -- long range, intermediate range and short range (project development) planning.

They are designed to furnish quantified, objective data to help meet the requirements of the National Environmental Policy Act in terms of resource planning and management. The guidelines furnish two kinds of basic support information for the resource decision-making process. These are as follows:

1. What are the scenic and esthetic values of different pieces of landscape as they exist today? This applies to all lands whether they have already undergone modification from the impact of man's activities or are relatively undisturbed.

2. What kind and magnitude of change from the existing can be expected if various resource management alternatives are applied. These can be used to weigh the various socio-economic trade offs that might be involved with some of the management alternatives. One of the future alternatives must be a "no go" alternative.

B. These basic concepts, procedures and criteria are oriented to forest timber harvesting activities but are equally applicable to transportation system planning, recreation planning and development, utility corridors, fire prevention and protection, location and design of housing for administration and protection services and other activities that have a potential for visual impact on the landscape.

The units into which the landscape is delineated and then characterized can be varied to meet the specific planning needs. These include units from the macro to micro scale as follows:

1. watershed boundaries

2. subwatersheds

3. seen areas or view sequences

4. landscape compositions

5. landforms

6. vegetation types

7. "cells" or resource capability units

8. sub units

9. stream channels

10. stream reaches

11. specific points

The value system is based on a series of indicators with each having its own set of criteria. These indicators include:

1. scenic quality

2. landscape character

3. physiographic sensitivity

4. socio/perceptual factors of sensitivity to landscape

example:

by

(Draft - 1/72)
Holcomb, Dennis
Six Rivers N.F.

15.03

1. Scenic Quality

A. Classify the entire Forest into one of several of the following levels of scenic quality using the rating criteria in (B) below.

Scenic Quality Rating	Management Needs
1. High Quality: visually superlative portions of the landscape, certain waterbodies and adjacent lands, and other select areas and objects toward which the public's will manifest itself. These landscapes display a high degree of Harmony and Variety.	Preservation: conscious management of the visual resource to keep its constituent parts intact and untrammeled by man.
2. Quality Landscapes: above average in degree of Harmony and variety but lacks the major dominant features found in the high quality landscape. Man's works may be visible, but do not offend.	Landscape Maintenance: Man's activities and works are kept subordinate to the visual strength and character of the landscapes they occur in. Landscape alterations to provide facilities and services are to be subtly integrated in such a manner that they attract little attention to themselves. Retention of existing landscape values is favored over large scale developments that would alter the visual composite to any great extent.
3. Monotonous Landscapes: Usually high in degree of harmony but lacking in sufficient variety of landform and vegetation to be visually noteworthy.	Landscape Enhancement: Management of the visual resource in which additional visual interest is provided through alterations by design and through adding harmonious structures. The intent of this type of management is to increase positive visual variety where little such variety now exists.
4. Discordant Landscapes: areas where the lines, forms, colors, and textures of man's works do not relate to and are not in sympathy with the lines, forms, colors, and textures characteristic of the natural landscape. Areas where man's works demean the quality of the natural landscape.	Landscape Rehabilitation: planning and design aimed at reversing or minimizing the detrimental effects of management activities which have degraded the scenic quality of the land.

B. Scenic Quality Rating Criteria

Visual Characteristic	High Quality Landscapes	Quality Landscapes	Monotonous Landscapes	Discordant Landscapes
Degree of Harmony:				
1. Man made improvements	Not highly visible	visible but not objectionable	-	visible and highly detracting.
sub total	12	6	-	D
Degree of Variety:				
1. Topography	*1500' Vert. (3) change/mile	500-1500' vert.(2) change/mile.	0-500' vert. (1) change/mile	-
2. Landform	Dominant land-(3) mark, formations of high interest	Formations pre-(2) sent but not unusual.	none present (0)	-
3. Water	Dominant water(3) feature, still reflections, or cascading white water.	Water present (2) but screened from view or not outstanding or noteworthy.	None present (0)	-
4. Vegetation arrangement	Broken, patchy,(3) and highly varied, with many plant communities represented.	2-3 vegetation (2) types, one dominant.	one type or (1) homogeneous mixture.	-
5. Wildlife	visible 75-100%(3) of the time	visible on an (2) irregular basis 50% of time.	absent to 25% (1) visible	-
6. Color	3 or more major(3) contrasting colors	2 major contrast-ing colors (2)	no major color (1) differentiation	-
sub total	12-18	6-11	0-6 (M)	
Uniqueness factors:	Unique or (3) rare species historically or archeologically significant areas	-	-	-
SUB TOTAL	3	-	-	-
TOTAL RATING	24+	10-24	M	D

15.05

2. Physiographic Sensitivity of the Landscape

A. The capacity of the landscape to absorb modifications of landform and vegetation without visual degradation is directly related to the physical characteristics of the land. Technological requirements, limitations upon our ability to modify the adverse affects, dollar costs, and the amount of physical damage that will occur to the landscape from various management activities is directly related criticalness of the following factors: (All landscape inventory units should be categorized into one of the 3 following classes.)

PHYSIO-SENSITIVITY RATING SYSTEM			
Ecological Factor	Critical: Mgmt. activities will result in significant degradation to scenery values	Mod. Critical: Mgmt. activities require special design skills to become compatible with scenery values.	Not Critical: Mgmt. activities will have relatively low impact on scenery values. No special design skills requir
SLOPE	75%+	25-75%	0-25%
LAND STABILITY	highly unstable	moderately unstable	moderately stable
VEGETATION TYPE/DENSITY	meadow, glade, grassland	brushland, hardwood,	conifer, riparian, or hardwood forest
SOIL PRODUCTIVITY	low	mod	high
SITE MICRO-CLIMATE/VEG. REPRODUCTION	SE,S,SW, & W, Exposures - (harsh/low)	E, NW exposures mod. harsh/mod.	N,NE exposures temperate/high
LANDFORM TYPE + VEG. PATTERN	EAST*WEST running ridges w/sharp vegetation changes on ridgeline.	all peaks, ridges, drainage features	flats, mid-slopes, minor ridges and drainage feat.
VEG. FRAGILITY	GLADE, meadow	riparian, grassland,	conifer, hardwood forest, brushland
WATER FEATURE	perennial stream or river	intermittent stream	minor drainage feature.

B. A critical reading from any one of the above factors would be adequate to indicate that scenic quality of the landscape cannot be protected or the cost of such protection may be economically prohibitive. Consideration of Marginal Stand classification would then be appropriate.

C. Areas containing moderate to critical factor readings, and which are being considered for management activities should include the special design skills of a landscape architect in timber sale planning and design.

3. SOCIO SENSITIVITY OF THE LANDSCAPE

A. Factors relating to what and how people see the landscape are important indicators of how "socially sensitive" the Forest is to the general public. The entire Forest should be classified into one of the following sensitivity categories based on the criteria below.

SOCIO-PERCEPTUAL SENSITIVITY			
Factor	Highly Critical	Mod. Critical	not Critical
ACCESS/ NO.'S OF VIEWERS	state hiway, county road, travel influ. zone.	main forest rd., not classified as T.I. zone.	spur road, minor forest roads.
RECREATION ACTIVITY	campground, concentrated use, water infl., major trail,	dispersed rec. use.	none
OBSERVER POSITION	superior	normal, inferior	none
DISTANCE TO VISIBLE AREA	1/4-3 miles	3 miles +	not visible
FEATURE ARRANGEMENT	focal points/ dominant features	other visible portions	invisible areas
TYPES OF VIEWERS	non-local, not employed in forest products industry	local, not employed in forest products industry. (Eureka)	local, employed in forest prod. industry. (Orleans
POLITICAL SENSITIVITY	high	mod	low
ARCHEOLOGICAL, HISTORICAL SIG.	high	mod	low
COMPATIBILITY W/ADJACENT USES	low	mod	high

B. A critical reading for any of these factors may be sufficient to suggest that preservation or maintenance of scenic quality may be the most appropriate form of management for such areas.

C. A mod. critical to critical reading is also indicative of the need to include the special design skills of the landscape architect in the planning and design of any modifications to occur in any such areas.

4. LANDSCAPE CHARACTER

Knowledge about the qualities of form, line, color, and textures, which characterize a landscape is the basis for determining the visual compatibility of proposed modifications with the natural landscape.

A. Classify the entire Forest (inventory units) into one of the following landscape composition types:

1. Panoramic Landscape
2. Feature landscape
3. Focal Landscape
4. Enclosed landscape
5. Canopied landscape
6. detailed landscape
7. Ephemeral landscape

B. Identify all dominant features within each composition type:

1. Landform features and patterns
2. Vegetation features and patterns
3. Water features and patterns
4. Sky patterns.
5. Fauna
6. Artificial objects

C. Describe the qualities of form, line, color, and texture, scale, etc., which characterize the features within each composition type.

D. For any proposed management activities within a given inventory unit describe the qualities of line, form , color, texture, and scale that would result from the modification.

E. Compare the qualities of line,form, color, texture, and scale in (C) with those in (D), and note the degree of contrast which exists between those elements.

1. strong contrast = 3
2. mod. contrast =2
3. weak contrast = 1

F. Multiply the values in (E) with the following weighted values for each element.

1. form = 4
2. line = 3
3. color= 2
4. texture=1

G. Interpretation - compatibility of natural landscape character and proposed landscape modification.

1. 21-30 Modification contrasts strongly with the natural character of the landscape, is not visually related to the natural

character of the landscape. Modification will dominate the natural landscape, and will most likely become a significant detraction. Is not visuall acceptable.

2. 11-20 Form and lines of the modification generally well related to the natural character of the landscape with color and textur being the major contrasting elements. Visually acceptable for landscapes in need of enhancement or rehabilitation. Generally not acceptable for landscapes in need of preservation or maintenance of scenic quality.

3. 0-10 Modifications well blended in form, line, color, and texture with the natural landscape. Nearly all contrasts are eliminated. Objectives of landscape maintenance are achieved with this rating.

III. Relationship of data to broad management zone classification:

Landscape Management Zone Prescription	Landscape Characteristics
1. Landscape Preservation	Any or all of the following: 1. High quality landscapes 2. High or critical physio-sensitivity 3. High sensitivity due to socio/perceptual factors 4. Natural form of the landscape incompatible with form of management actions.
2. Landscape Maintenance	1. Quality- High quality landscapes 2. Mod.- highly sensitive landscapes due to socio/perceptual factors. 3. High capability to undergo physical change without degradation 4, High degree of compatibility between natures forms and man's forms.
3. Landscape Enhancement	1. Monotonous landscapes 2. Moderate - low in socio-sensitivity. 3. Mod. - High capability to undergo physical change without degradation 4. Mod. to high compatibility of nature's form's and Man's forms.
4. Landscape Rehabilitation	1. Discordant landscapes 2. Mod.-llow socio-sensitivity 3. Mod. - high capability to undergo change w/out degradation 4. Mod - high compatibility of nature's forms and Man's forms.

ENGINEERING TECHNICAL REPORT
ETR-7700-2

example

SCENIC ROAD

A Basis For Its Planning, Design and Management

By: REGINALD C. PRAGNELL
Landscape Architect
USDA, Forest Service
Division of Engineering

December 1969

DISTANCE RATING

Criteria (300 ft. from road to 30 + miles)

PLUS-POINTS	DESCRIPTION	IMPACT ON RATER
3	Spectacular high mountain range; mountains beyond a large lake, a close view of a colorful valley (view 1/2 to 30 miles).	EXCITING! STIMULATING! AROUSES A DOMINANT INTEREST. OVERCOMES SECONDARY DISTRACTIONS!
2	Undisturbed general mountain or forest scenery (view 1/4 to 30 miles).	Nice; soothing. Attractive - unobtrusive.
1	Mountain or forest scenery with not too obviously disturbed conditions such as road scars, recent burns, power line clearings, clear cut, etc.	Commonplace - customary - often met with borderline to disturbing.
MINUS-POINTS		
1 through 3	Disturbances from the natural to eyesores in the distant settings of mountain or forest scenery. From 1 through 3 - Incidental to very strong eyesores.	FROM: Noticeable, unnatural, artifical, unsuitable. TO: Blight, ugliness and bitterness

Criteria (Center Line Road to + 300 ft. Alongside)

PLUS-POINTS	DESCRIPTION	IMPACT ON RATER
3	Spectacular adjacent scenery as a white capped river, moss covered cliffs, monarch trees, wild flower covered meadow where people slow down or stop to observe. Usually requiring a paved, safely designed road. Curvilineal alinement.	Exciting! Stimulating scenery. Vehicular travel, smooth, effortless. Arouses a dominant interest in trip.
2	Undisturbed typical foreground. Scenery, sufficient visibility between trees to escape a confined feeling. Usually requiring a smooth gravel road with general safety at design speeds.	Nice; attractive; unobtrusive. Vehicular travel requires incidental effort or concern to a passenger.
1	Foreground scenery with not too obvious disturbance as incidentally high stumps, raw cut banks, possibly visible telephone lines, new TSI work. Usually a single trace gravel road with turnouts, lightly used road. Scenery can be tight, but not confined.	Commonplace; customary. Vehicular travel requires some effort - borderline to disturbing.

MINUS-POINTS		
1 through 3	Unnatural-disturbed facilities in the close secenery to eyesores such as stumping cut banks, exposed gravel pits, dumps, windrow of stumps and rocks, power line cutting obvious, etc. Road travel from unsatisfactory to unsafe. From 1 through 3, incidental to very strong eyesores. Confined, tunnel-effect scenery.	FROM: Noticeably unnatural, artificial, unsuitable, uncomfortable, disgruntled. TO: Ugly - bitterness - disgusted - repulsiveness.

VARIETY AND INTEREST RATING

Criteria (Road, Foreground and Distance Scenery)

PLUS-POINTS	DESCRIPTION	IMPACT ON RATER
3	Road includes view of many attractive features in the normal line of sight for the driver, including some of the following: snow capped peaks, rock cliffs, historic points of interest, architecturally interesting bridges, lakes, open meadows, uneven age timber stands, etc.	Exciting! Stimulating scenery; curious - arouses a dominant interest in the trip. Very satisfying.
2	Road includes view of a few attractive features, some may be available by scanning the entire scene.	Nice! Attractive; pleasant; agreeable - unobtrusive.
1	A road with a near monotone of scenery boring, because of sameness and a lack of interest in the total landscape. Emphasis can turn to conversation and other distractions.	Commonplace; usual; ordinary; incidental.

MINUS-POINTS		
1 through 3	From a monotonous to a foreboding appearance for the entire route.	FROM: Mind on things other than scenery - ignore the view. TO: Glum, repulsive; offensive

SCENERY CLASSIFICATION
FOR FOREST ROADS

RECONNAISSANCE
Rating Sheet
Appraiser_____ Date_____

Type of road: 22' width; gravel surface
Purpose of road: Other, recreation, timber
(Primary) (Secondary)

% Forest Road: 60%
Time and Date: July 15, 1967; 2-4:00 P.M.
Visibility: Excellent

Name of Road: East Fork Road #143
Starting point: Jones Junction
Ends: Jones Ranch
Total length: 6.0 miles
Direction: West

(1) Stations or units of miles	(2) Distance rating from the road	(3) Foreground rating inc. the road	(4) Road and roadside. Variety and interest.	(5) Total Ratings	(6) Special Points of interest.	(6-A) Eyesores and objectionable features.	(6-B) Remarks, special problems and solutions.
Example	Exist-Pot.	Exist-Pot	Exist-Pot.	Exist-Pot.			
0-2 mi.	2 3	2 3	2 3	6 9	Clearing for mtn. view at stations 1.5 (North). Interesting farm.	Slash along road edge. Some banks need stabilization. Culvert at 1.9 extends too far.	Very little work required to bring section up to top quality. Job Corps project recommended. Opening of views would improve variety and views.
2-4 mi.	1 1	-2 1	1 -1	0 +1	- - -	Car dump and standing dead trees and slash on private land are problems	Most area seen is private land. Foreground can be improved by planting screen in right-of-way; may be losing battle.
4-6 mi.	2 3	-1 2	3 3	4 8	An overlook potential at 5.2	Gravel pit needs screening. Road betterment needed to best serve public.	Potential improvement mostly the need of a better road.
Average Totals	1.7 2.3	-0.3 2.3	2.0 1.7	3.3 6			

CONCLUSIONS

The route could be improved by (1) clearing views of the distant country from the road, (2) screening the eyesores, and (3) improving 1-1/2 miles of road by betterment. Because of the value of land status and county, only medium priority suggested.

ECONOMIC VALUES OF NATURAL BEAUTY ON RURAL ROADS

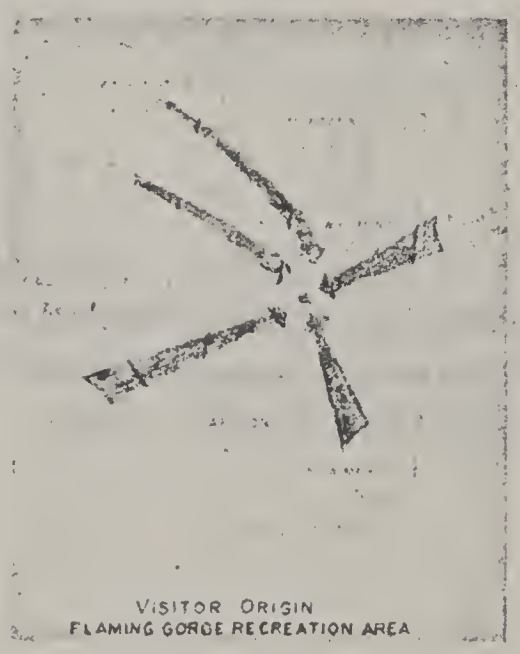
Condensation of Reginald C. Pragnell's speech
presented to Western Association of State
Highway Officials meeting at Cheyenne, Wyoming
September 15-20, 1968

There are a number of analytical procedures of evaluating the economical benefits of natural beauty:

By developing statistics of existing or potential road users, the entire spectrum of motorist requirements for natural beauty can be evaluated.

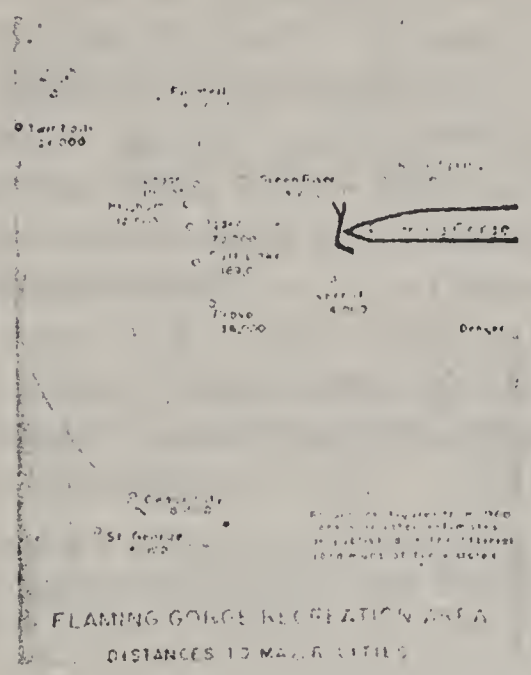
By rating a classification system, roadside scenery can be evaluated, classified and appraised.

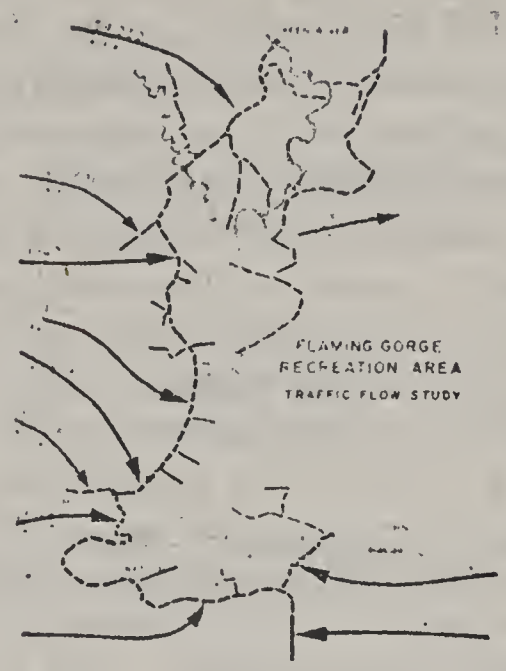
By correlating economic values of natural beauty with people desire for this resource. (The economic benefit of attractive country for those assimilating scenery as a secondary value would best be developed through regular methods of economic and politic analysis - until research offers strong support data.)



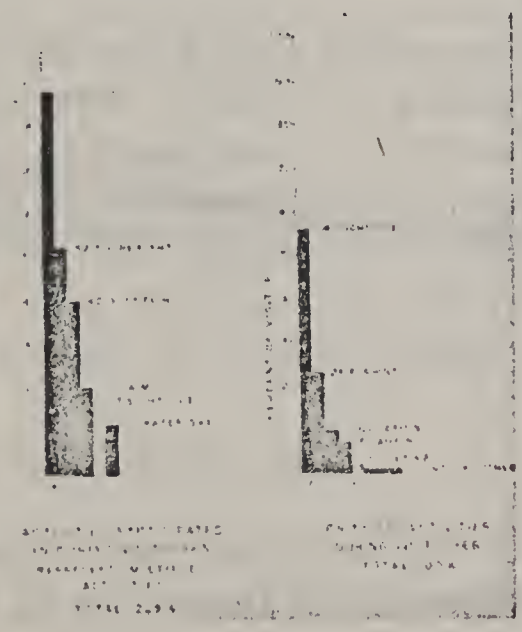
By deriving benefits of improved land values and suppliers of accommodations through highway adjacency with exceptional natural beauty, using usual procedures.

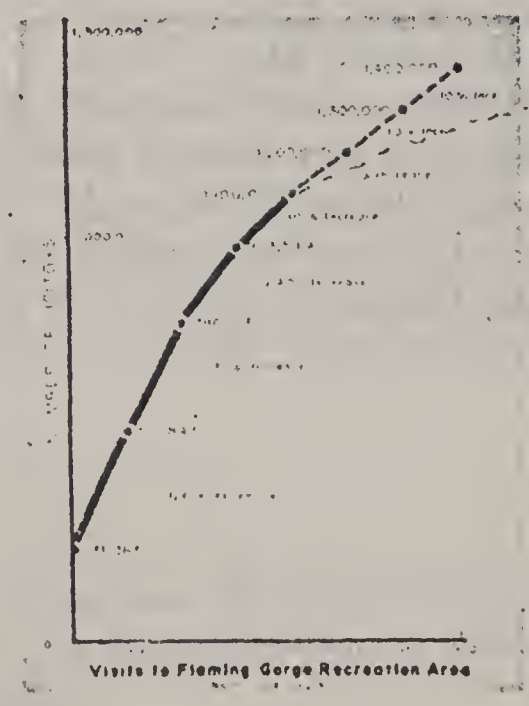
By obtaining costs of natural beauty on rural highways through alinement and profile decisions.





By planning and assembling all available facts and statistics compiled by the most professional techniques and professions, a realistic figure equating the economic value of natural beauty can be developed. The analysis of scenery is done by sensitive evaluations and practical reasoning. Methods suggested are: recreational approach per Senate Document #97, "Time is Money" approach, Red Book and the expenditure method. These approaches may supplement or substitute present analysis of functions and cost studies of highways, particularly where the motorist desire and the adjacent landscape quickly require this particular concern.





The Recreation Approach to Economic Values Under Senate Document #97

Today, government agencies are required to include recreation with other benefits in justifying expenditures of funds for water resource projects. Measuring economic benefits of recreation is not too different from that produced by natural beauty. Both represent value. The term recreation activities includes both active and passive activities such as swimming, picknicking, hiking, sight-seeing, nature studies, camping, fishing, etc. The point is that parts of recreation activities are identical to the experience of viewing scenic country from within a vehicle or at a road related scenic point. The estimates of value vary from 50¢ to $6.00 or more per visitor day. The higher quality esthetic experience rates a higher value. A recreation day is considered the average time spent during a day for a particular activity. Also considered in establishing the economic value is the availability of other competitive recreation opportunities as well as the user costs per person.

The "Expenditure" Method

The Sandia Crest Highway near Albuquerque, New Mexico, can be used to illustrate another way the "Economic Values of Natural Beauty" can be obtained. The trip is along a circular route of 72 miles, ending at Sandia Crest, where one can view the State of New Mexico from 60 to 100 miles in any direction.

Figuring 72 miles x the average yearly number of vehicles using this route, 200,000 x 7¢ per mile vehicle expense, the people of Albuquerque and their visitors are spending nearly a million dollars per year for a scenic destination trip. This does not include an anticipated projected increase in traffic nor the incidental expenses such as photograph supplies, luncheons, etc., used en route.

Scenery Classification Chart

Using the suggested "Scenery Classification Chart", the route will rate as very high in comparison to other scenic routes; for example:

Distance rating + 3 (Spectacular distance views)

Foreground rating +2 5/8 (Excellent overlooks and good cover except for first few miles of trip outside Albuquerque).

Variety and interest +3 (Many opportunities for different experiences, variety of seasons, trip not tiresome, etc.)

From this, assuming a visitor experience value of $4.00 per tourist day (Recreation Approach - Senate Document #97, derived by comparing other recreation potentials near Albuquerque, their costs, prestige of trip, comparable experience); using established statistics of 3.8 people per car; estimating that a three hour trip is involved which includes numerous scenic point stops; etc.: the economic road benefit could be converted into $5.07 per vehicle hour.

On proposed routes, each different alinement can be rated with its vehicle per hour benefits compared to the highway costs.

The "Time is Money" Approach

A long advanced concept is that "Time is Money." Under this approach, time has a value in relation to the motorist's lifetime earning capacity and the time spent gaining certain experiences.

Using the Snowy Range Route on the Medicine Bow National Forest as an example: Figure an average of four people per car (husband, wife, son and daughter). Estimating their combined lifetime earning capacity as $600,000, using an eight hour day for earning and activity time and a sixty year life span, this computes to $3.50 per one vehicle hour ($600,000 ÷ 175,000 = $3.50 or $14.00 for a four hour on-site activity).

The Red Book Approach

According to the "Red Book," the unit values of travel time for passenger cars equal $1.55 per hour. A Stanford Research Institute

study dated May 1967 increases this value to $3.10 per hour per vehicle for multiple highways and roads. These values are largely tied in with the economic values of the savings in time, operating costs, reductions in accidents, and so on.

The four methods illustrated will not necessarily develop the identical economic benefit on a given scenic road. It will often be desirable to evaluate a road project by the different approaches and establish from the various answers the most justifiable or "average" available solution.

In our present society, more and more people are willing to pay extremely high costs for the enjoyments of life. The value for natural beauty raises the base values, at least for those with this interest, to a higher value than that of commercial traffic.

There are two typical situations that come to mind where, besides the normal expense of the trip and time, a toll is charged for the scenic experience. Namely, they are the Seventeen Mile Drive in California and the Pike's Peak Highway in Colorado.

The Seventeen Mile Drive is in an area of private ownership called the Del Monte Forest. The average time a tourist spends making the drive is estimated at two and one-half hours. During 1965 and 1967, an average of about 300,000 tourist cars visited the area each year. The fee then was $2.00. Approximately $600,000 was expended by tourists annually for right of entry alone to the drive. This is proof positive that given quality scenic travel, natural beauty has economic value similar to any other natural resource. Similarly, approximately $340,000 was obtained in toll revenue on the Pike's Peak Highway.

Motor vehicle use studies have shown that at least one-third, and perhaps 50%, of the automotive travel in the United States is for pleasure. A Tellico River Road study made by the Forest Service on the Cherokee National Forest in Tennessee offers a clue to the extensive number of visitors on a typical Forest road who rate their primary interest as scenery. Of every four people interviewed, two reported their primary purpose was for enjoyment of scenery; one rated scenery of secondary value; and the other did not consider it important.

The demand for scenic travel is often great because of the willingness and the desire of motorists to pay measurable sums of money and to allot their time for specific scenic trips. The use of a scenic quality economic analysis is one more support unit in making engineering management and planning decisions. The techniques could be one or more of the four approaches shown above.

14. Social Values

Use of Social Values

In many cases where a resource manager is making decisions on resource management programs or projects or the alternatives that relate to them the social value or sometimes referred to as socio-economic factors involved in a particular area may be very important. It may be that the demand for resource outputs can be met several ways through various programs or projects; but within these, there are those that have more effective social characteristics for the surrounding communities or populations involved, as well as also being sound in terms of good resource economics and desirable or acceptable environmental effects.

Maintaining or improving social values may be stated as part of the resource objectives. They might include social objectives such as: (1) better income distribution, (2) better recreation availability distribution, (3) more jobs, (4) higher basic incomes, (5) reduced unemployment, (6) cultural aspects, and others. Relating to these, there are a series of criteria which can be used to gage or predict the effectiveness of programs or projects in meeting these objectives. The criteria are used to rank and compare alternatives with one another to assist the resource management in his decision making process.

Social Criteria

The criteria applied to various social objectives may be a combination of value judgment and quantified data. Some criteria are more adequate or meaningful than others. In many cases, some assistance from people more familiar or skilled in the social fields can be of much help. A partial list of criteria is included with this section. Other criteria have been developed or could be developed that would apply to various social objectives.

Social Criteria

Objective: Income Distribution

Objective: Reduced Unemployment

Criteria:

1. Trains presently unemployed in higher skills or utilize present skills.
2. Uses local unemployed before bringing in unemployed groups from outside.
3. Does not displace workers or induce unemployment to occur in other areas outside the Region.

Objective: Cultural Aspects

Criteria:

1. Does not induce negative cultural impacts on the community or its members.
2. When tradition and cultures are shifting or changing, the programs or projects do not produce sudden or abrupt transitions that upset the community social balance or accelerate changes beyond what is acceptable to the community.

Criteria:

1. Income transfers from higher to lower income groups.
2. New or additional income to lower income groups.
3. Better geographic distribution of income.
4. Shifts of income to specific ethnic or social groups.
5. Relative shifts in income distribution among the various labor and management inputs used to produce a resource output or commodity.
6. Number of jobs created and their income group distribution.
7. Longer or more stable employment for various income groups or ethnic groups.

Objective: More jobs

Criteria:

1. Increased income that improves the quality of life for lower income groups and minority or disadvantaged groups.
2. Reduction in the need for subsidies or supplementing income payments. Allows allocations of more money to other vital needs in the community.

Each situation will need to be characterized and the objectives determined. Once this is done, development of suitable criteria and data acquisition to gage and rank the effectiveness in meeting social objectives can begin.

PART IV - APPENDIX

1. PRICE INDEXES - ADJUSTMENT FACTORS

Basic Procedures

Usually two types of indexes or adjustment factors are available from various sources. One type gives factors directly for all years in relation to the current year. This factor can be multiplied directly with the particular value being derived. The other type gives numbers in relation to a particular base year that occurred in the past. That base year is assigned the number "100;" all other years are either greater or less than "100." To adjust a past value to its equivalent current value, the index of the old number is divided into the current index and the result is multiplied by the old value.

For example:

The published whole price index - 1967 = 100 shows:

Year		Factor
1960	=	94.9
1961	=	94.5
1962	=	94.8
1963	=	94.5
1964	=	94.7
1965	=	96.6
1966	=	99.8
1967	=	100.0
1968	=	102.5
1969	=	106.5
1970	=	110.4
1971	=	113.9

To convert a $500 1969 value to a 1971 cost value:

$$\left\langle \frac{\text{1969 cost value}}{\text{Index factor for 1969}} \right\rangle \quad x \quad \left\langle \text{1971 Index factor} \right\rangle$$

i.e., $\frac{\$500}{106.5} \times 113.9 = \$535$

To convert a $500 1960 cost to a 1971 cost value:

$$\frac{\$500}{94.9} \times 113.9 = \$600$$

Sources of Indexes and Factors

Several sources of information on indexes and factors exist. The Economic Report of the President is published each year about in February. It gives these key indexes:

1. Indexes of Prices Received and Paid by Farmers by Commodities.

2. Wholesale Price Indexes by Stage of Processing.

3. Consumer Price Indexes by Special Groups.

4. The same as (3) by by Major Groups.

5. Aggregated Consumer Price Indexes in the U. S. and other countries.

The Monthly Labor Review published by the U. S. Dept. of Labor provides a variety of price indexes on a monthly basis. These include:

1. Wholesale Price Indexes by
   a. Special Commodity groupints
   b. Group and Subground Commodities

2. Wholesale Price Indexes by
   a. The U. S. and Key Cities
   b. By Selected Areas

3. Average consumre Price Indexes for the United States by Commodity Groups and Subgroups

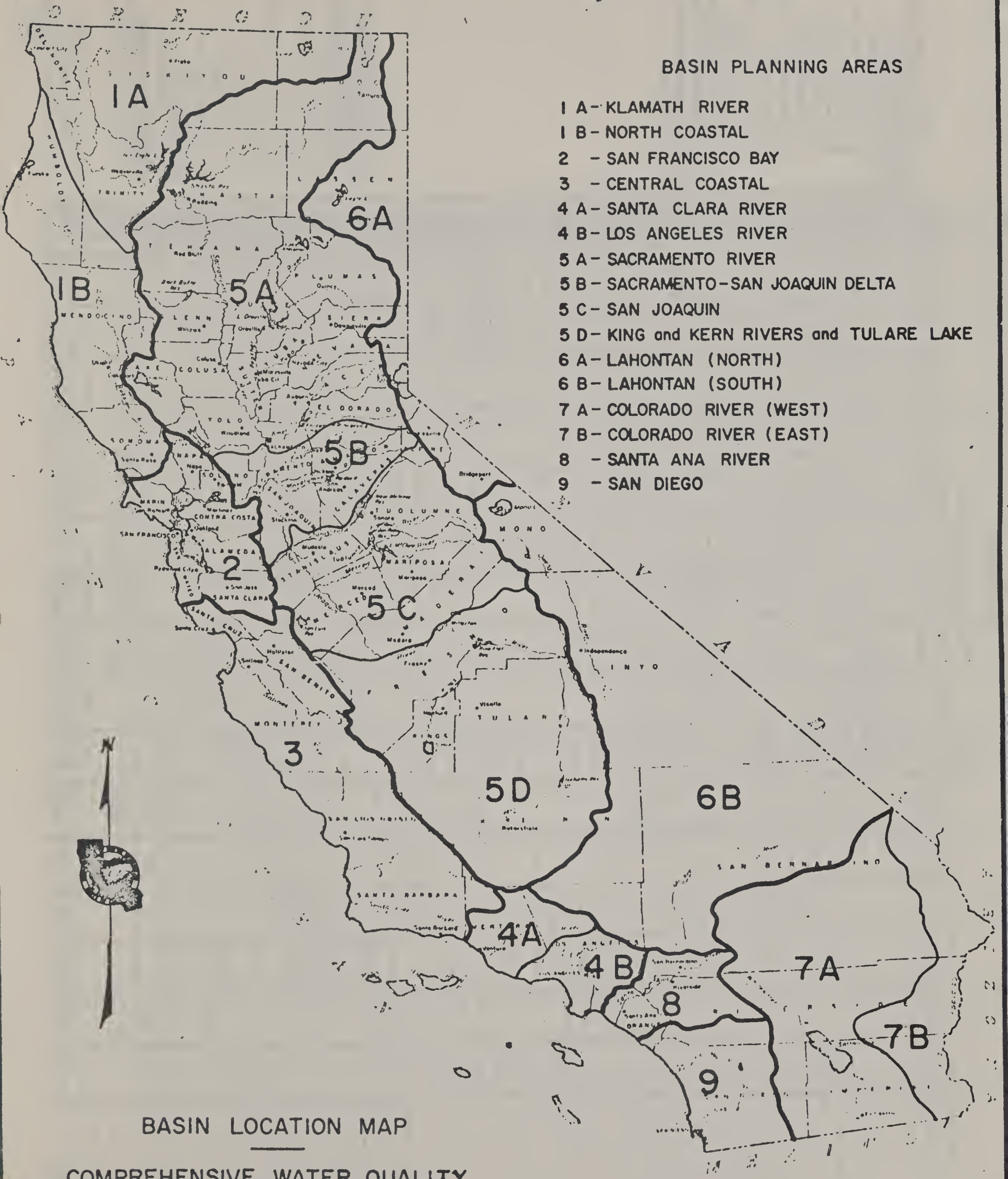
The Engineering News Record publishes semi-annual cost indexes for construction materials along with wage data.

Austin Industrial Building Cost Index covers cost of construction materials. These indexes reflect changes in productivity.

Population Est.

BASIN PLANNING AREAS

1 A - KLAMATH RIVER
1 B - NORTH COASTAL
2 - SAN FRANCISCO BAY
3 - CENTRAL COASTAL
4 A - SANTA CLARA RIVER
4 B - LOS ANGELES RIVER
5 A - SACRAMENTO RIVER
5 B - SACRAMENTO-SAN JOAQUIN DELTA
5 C - SAN JOAQUIN
5 D - KING and KERN RIVERS and TULARE LAKE
6 A - LAHONTAN (NORTH)
6 B - LAHONTAN (SOUTH)
7 A - COLORADO RIVER (WEST)
7 B - COLORADO RIVER (EAST)
8 - SANTA ANA RIVER
9 - SAN DIEGO



BASIN LOCATION MAP

COMPREHENSIVE WATER QUALITY CONTROL PLANS

STATE OF CALIFORNIA POPULATION ESTIMATES BY COUNTIES AND WATER QUALITY MANAGEMENT BASIN PLANNING AREAS

(In thousands) 1/

1970 BASIN PLANNING AREA 2/

COUNTIES	1-A	1-B	2	3	4-A	4-B	5-A	5-B	5-C	5-D	6-A	6-B	7-A	7-B	8	9	Total
Alameda			1076.1														1076.1
Alpine											0.5						0.5
Amador								12.0									12.0
Butte							102.0										102.0
Calaveras								10.7	2.9								13.6
Colusa							12.4										12.4
Contra Costa			560.7														560.7
Del Norte	14.6																14.6
El Dorado							23.0	5.0			16.0						44.0
Fresno									8.5	405.4							413.9
Glenn							17.6										17.6
Humboldt	3.9	95.8															99.7
Imperial													71.8	3.1			74.9
Inyo												15.6					15.6
Kern										287.0		43.0					330.0
Kings										64.7							64.7
Lake		0.1					19.6										19.7
Lassen							3.0				13.8						16.8
Los Angeles					58.2	6898.0						78.0					7034.2
Madera									41.6								41.6
Marin		0.7	206.1														206.8
Mariposa									6.1								6.1
Mendocino		51.5															51.5
Merced									105.5								105.5
Modoc	1.3						5.0				1.2						7.5
Mono											1.8	2.3					4.1
Monterey				249.1													249.1
Napa			79.1				0.6										79.7
Nevada							24.2				2.4						26.6
Orange															1354.0	78.1	1432.1
Placer							71.3				6.3						77.6
Plumas							11.8										11.8
Riverside													101.8	16.8	339.0	3.6	461.2
Sacramento							608.8	26.0									634.8
San Benito				18.0						0.3							18.3
San Bernardino												96.9	24.2	5.9	560.7		687.3
San Diego													2.0			1356.5	1358.5
San Francisco			714.3														714.3
San Joaquin								255.5	37.4								292.9
San Luis Obispo				106.7													106.7
San Mateo			556.3														556.3
Santa Barbara				264.7													264.7
Santa Clara			1043.6	29.0													1072.6
Santa Cruz				124.1													124.1
Shasta							77.9										77.9
Sierra							2.4										2.4
Siskiyou	24.7						8.6										33.3
Solano			138.4				7.0	27.0									172.4
Sonoma		142.2	63.0														205.2
Stanislaus								0.3	195.0								195.3
Sutter							42.0										42.0
Tehama							29.6										29.6
Trinity	7.1	0.6															7.7
Tulare										189.4							189.4
Tuolumne									22.4								22.4
Ventura					379.7												379.7
Yolo							72.2	20.0									92.2
Yuba							44.8										44.8
Sub-basin Total	51.6	290.9	4437.6	791.8	437.9	6898.0	1183.8	356.5	419.4	946.8	42.0	235.4	199.8	25.8	2253.7	1438.2	20009.0

SUBBASIN PLANNING AREAS

1-A Klamath River
1-B North Coastal
2 San Francisco Bay
3 Central Coastal
4-A Santa Clara River
4-B Los Angeles River
5-A Sacramento River
5-B Sacramento-San Joaquin Delta
5-C San Joaquin
5-D King & Kern Rivers & Tulare La
6-A Lahontan (North)
6-B Lahontan (South)
7-A Colorado River (West)
7-B Colorado River (East)
8 Santa Ana River
9 San Diego

1/ July 1 Estimate. See Text, Attached.
2/ As described in Text.

State of California
The Resources Agency
Department of Water Resources
November 1, 1971

Revised January 4, 1972; March 15, 19

1975

BASE PLAN

STATE OF CALIFORNIA POPULATION PROJECTIONS BY COUNTIES AND WATER QUALITY MANAGEMENT BASIN PLANNING AREAS

(In thousands) 1/

Series D Fertility
150,000 Net In-migration

1975 BASIN PLANNING AREA 2

COUNTIES	1-A	1-B	2	3	4-A	4-B	5-A	5-B	5-C	5-D	6-A	6-B	7-A	7-B	8	9	Total
Alameda			1141.5														1141.5
Alpine											0.5						0.5
Amador								13.2									13.2
Butte							106.0										106.0
Calaveras								11.1	4.0								15.1
Colusa							12.5										12.5
Contra Costa			616.6														616.6
Del Norte	14.4																14.4
El Dorado							23.2	5.0			20.1						48.3
Fresno									9.0	423.8							432.8
Glenn							17.3										17.3
Humboldt	3.9	99.3															103.2
Imperial													74.8	3.8			78.6
Inyo												17.3					17.3
Kern										302.1		45.0					347.1
Kings										66.2							66.2
Lake		0.1					22.5										22.6
Lassen							3.1				14.5						17.6
Los Angeles					86.7	7063.0						105.0					7254.7
Madera									42.0								42.0
Marin		0.7	229.1														229.8
Mariposa									6.6								6.6
Mendocino		55.2															55.2
Merced									110.5								110.5
Modoc	1.4						5.1				1.2						7.7
Mono											2.0	3.0					5.0
Monterey				274.9													274.9
Napa			87.1				1.0										88.1
Nevada							26.7				2.0						28.7
Orange															1594.7	93.0	1687.7
Placer							77.3				6.0						83.3
Plumas							12.2										12.2
Riverside													109.7	18.8	366.3	3.9	498.7
Sacramento							654.0	29.0									683.0
San Benito				19.4						0.3							19.7
San Bernardino												104.8	29.0	7.0	609.0		749.8
San Diego													3.0			1566.8	1569.8
San Francisco			712.1														712.1
San Joaquin								277.9	36.6								314.5
San Luis Obispo				116.5													116.5
San Mateo			582.3														582.3
Santa Barbara				285.8													285.8
Santa Clara			1165.0	54.0													1219.0
Santa Cruz				138.9													138.9
Shasta							83.8										83.8
Sierra							2.5										2.5
Siskiyou	24.8						8.7										33.5
Solano			146.9				9.0	32.0									187.9
Sonoma		160.9	74.5														235.4
Stanislaus								0.3	216.2								216.5
Sutter							45.3										45.3
Tehama							30.6										30.6
Trinity	7.3	0.6															7.9
Tulare										199.9							199.9
Tuolumne									25.5								25.5
Ventura					451.0												451.0
Yolo							80.9	23.0									103.9
Yuba							46.3										46.3
Sub-basin Total	51.3	316.3	4755.1	889.5	537.7	7063.0	1267.9	391.5	450.4	992.3	46.3	275.1	216.5	29.6	2570.0	1663.7	21517.

SUBBASIN PLANNING AREAS

1-A Klamath River
1-B North Coastal
2 San Francisco Bay
3 Central Coastal
4-A Santa Clara River
4-B Los Angeles River
5-A Sacramento River
5-B Sacramento-San Joaquin Delta
5-C San Joaquin
5-D King & Kern Rivers & Tulare Lake
6-A Lahontan (North)
6-B Lahontan (South)
7-A Colorado River (West)
7-B Colorado River (East)
8 Santa Ana River
9 San Diego

1/ July 1 Estimate. See Text, Attached.
2/ As described in Text.

State of California
The Resources Agency
Department of Water Resources
November 1, 1971

Revised January 4,1972:March 15, 1972

21.02

1980 X-

BASE PLAN

STATE OF CALIFORNIA POPULATION PROJECTIONS BY COUNTIES AND WATER QUALITY MANAGEMENT BASIN PLANNING AREAS

(In thousands) 1/

Series D Fertility
150,000 Net In-migration

1980

BASIN PLANNING AREA 2/

COUNTIES	1-A	1-B	2	3	4-A	4-B	5-A	5-B	5-C	5-D	6-A	6-B	7-A	7-B	8	9	Total
Alameda			1217.7														1217.7
Alpine											0.6						0.6
Amador								14.3									14.3
Butte							111.2										111.2
Calaveras								12.1	5.0								17.1
Colusa							12.7										12.7
Contra Costa			689.1														689.1
Del Norte	15.0																15.0
El Dorado							25.2	5.1			24.2						54.5
Fresno									11.0	443.1							454.1
Glenn							17.7										17.7
Humboldt	4.0	104.0															108.0
Imperial													79.1	4.4			83.5
Inyo												19.8					19.8
Kern										319.8		47.0					366.8
Kings										69.4							69.4
Lake		0.2					25.8										26.0
Lassen							3.1				15.3						18.4
Los Angeles					145.0	7373.5						162.0					7680.5
Madera									42.2								42.2
Marin		0.7	261.2														261.9
Mariposa									7.7								7.7
Mendocino		59.4															59.4
Merced									117.0								117.0
Modoc	1.4						5.2				1.2						7.8
Mono											2.3	3.9					6.2
Monterey				303.5													303.5
Napa			101.5				1.0										102.5
Nevada							28.7				3.0						31.7
Orange															1830.7	109.0	1939.7
Placer							88.0				7.0						95.0
Plumas							12.6										12.6
Riverside													122.5	21.8	423.9	4.3	572.5
Sacramento							710.5	30.0									740.5
San Benito				21.7						0.3							22.0
San Bernardino												120.0	36.0	9.2	686.0		851.2
San Diego													5.0			1785.8	1790.8
San Francisco			721.6														721.6
San Joaquin								303.5	36.6								340.1
San Luis Obispo				133.1													133.1
San Mateo			613.1														613.1
Santa Barbara				321.2													321.2
Santa Clara			1289.6	97.0													1386.6
Santa Cruz				161.1													161.1
Shasta							91.5										91.5
Sierra							2.6										2.6
Siskiyou	25.6						8.8										34.4
Solano			163.4				12.0	38.9									214.3
Sonoma		185.7	89.4														275.1
Stanislaus								0.3	240.2								240.5
Sutter							49.1										49.1
Tehama							31.9										31.9
Trinity	7.6	0.6															8.2
Tulare										211.5							211.5
Tuolumne									29.3								29.3
Ventura					574.7												574.7
Yolo							92.0	27.0									119.0
Yuba							49.1										49.1
Sub-basin Total	53.6	350.6	5142.6	1037.6	719.7	7373.5	1378.7	431.2	489.0	1044.1	53.6	352.7	242.6	35.4	2940.6	1899.1	23548.6

SUBBASIN PLANNING AREAS

1-A Klamath River
1-B North Coastal
2 San Francisco Bay
3 Central Coastal
4-A Santa Clara River
4-B Los Angeles River
5-A Sacramento River
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5-C San Joaquin
5-D King & Kern Rivers & Tulare Lake
6-A Lahontan (North)
6-B Lahontan (South)
7-A Colorado River (West)
7-B Colorado River (East)
8 Santa Ana River
9 San Diego

1/ July 1 Estimate. See Text, Attached.
2/ As described in Text.

State of California
The Resources Agency
Department of Water Resources
November 1, 1971

Revised January 4, 1972:March 15.1972

21.03

1990 X

BASE PLAN

STATE OF CALIFORNIA POPULATION PROJECTIONS BY COUNTIES AND WATER QUALITY MANAGEMENT BASIN PLANNING AREAS

(in thousands) 1/

Series D Fertility
150,000 Net In-migration

1990 BASIN PLANNING AREA 2

COUNTIES	1-A	1-B	2	3	4-A	4-B	5-A	5-B	5-C	5-D	6-A	6-B	7-A	7-B	8	9	Total
Alameda			1380.2														1380.2
Alpine											0.7						0.7
Amador								16.4									16.4
Butte							125.4										125.4
Calaveras								14.2	6.1								20.3
Colusa							13.4										13.4
Contra Costa			852.4														852.4
Del Norte	16.9																16.9
El Dorado							29.0	6.0			32.0						67.0
Fresno									13.5	490.6							504.1
Glenn							18.2										18.2
Humboldt	4.2	113.8															118.0
Imperial													92.4	6.3			98.7
Inyo												24.6					24.6
Kern										351.2		57.0					408.2
Kings										77.8							77.8
Lake		0.4					32.8										33.2
Lassen							3.4				16.3						19.7
Los Angeles					266.6	8114.0						310.0					8690.6
Madera									42.8								42.8
Marin		0.7	335.2														335.9
Mariposa									9.9								9.9
Mendocino		69.0															69.0
Merced									130.7								130.7
Modoc	1.4						5.2				1.2						7.3
Mono											3.1	6.0					9.1
Monterey				368.4													368.4
Napa			145.3				2.0										147.3
Nevada							33.2				4.0						37.2
Orange															2291.0	165.3	2456.3
Placer							114.9				9.0						123.9
Plumas							13.1										13.1
Riverside													150.1	26.7	550.7	5.3	732.8
Sacramento							827.3	38.0									865.3
San Benito				27.3						0.3							27.6
San Bernardino												175.0	55.0	13.8	840.0		1083.8
San Diego													10.0			2243.1	2253.1
San Francisco			730.0														730.0
San Joaquin								354.9	38.6								393.5
San Luis Obispo				172.1													172.1
San Mateo			677.1														677.1
Santa Barbara				439.8													439.8
Santa Clara			1596.4	163.9													1760.3
Santa Cruz				208.6													208.6
Shasta							109.1										109.1
Sierra							2.7										2.7
Siskiyou	27.6						8.9										36.5
Solano			222.0				21.0	60.1									303.1
Sonoma		245.0	125.5														370.5
Stanislaus								0.3	292.1								292.4
Sutter							57.9										57.9
Tehama							33.8										33.8
Trinity	7.8	0.6															8.4
Tulare										236.4							236.4
Tuolumne									36.4								36.4
Ventura					905.6												905.6
Yolo							121.7	33.9									155.6
Yuba							58.5										58.5
Sub-basin Total	57.9	429.5	6064.1	1380.1	1172.2	8114.0	1631.5	523.8	570.1	1156.3	66.3	572.6	307.5	46.8	3681.7	2413.7	28188.1

SUBBASIN PLANNING AREAS

1-A Klamath River
1-B North Coastal
2 San Francisco Bay
3 Central Coastal
4-A Santa Clara River
4-B Los Angeles River
5-A Sacramento River
5-B Sacramento-San Joaquin Delta
5-C San Joaquin
5-D King & Kern Rivers & Tulare Lake
6-A Lahontan (North)
6-B Lahontan (South)
7-A Colorado River (West)
7-B Colorado River (East)
8 Santa Ana River
9 San Diego

1/ July 1 Estimate. See Text, Attached.
2/ As described in Text.

State of California
The Resources Agency
Department of Water Resources
November 1, 1971

Revised January 4, 1973 March 15, 1972

21.04

BASE PLAN

STATE OF CALIFORNIA POPULATION PROJECTIONS BY COUNTIES AND WATER QUALITY MANAGEMENT BASIN PLANNING AREAS

(in thousands) 1/

2000

Series D Fertility
150,000 Net In-migration

2000 BASIN PLANNING AREA 2

COUNTIES	1-A	1-B	2	3	4-A	4-B	5-A	5-B	5-C	5-D	6-A	6-B	7-A	7-B	8	9	Total
Alameda			1510.7														1510.7
Alpine											0.8						0.8
Amador								18.0									18.0
Butte							136.9										136.9
Calaveras								15.8	6.9								22.7
Colusa							14.2										14.2
Contra Costa			988.7														988.7
Del Norte	17.5																17.5
El Dorado							34.8	7.0			36.8						78.6
Fresno									16.0	536.8							552.8
Glenn							18.8										18.8
Humboldt	4.6	123.6															128.2
Imperial													105.5	7.6			113.1
Inyo												30.0					30.0
Kern										372.7		77.0					449.7
Kings										87.0							87.0
Lake		0.5					40.5										41.0
Lassen							3.7				18.0						21.7
Los Angeles					450.5	8752.0						450.0					9652.5
Madera									44.5								44.5
Marin		0.7	402.6														403.3
Mariposa									12.1								12.1
Mendocino		78.9															78.9
Merced									145.2								145.2
Modoc	1.5						5.2				1.2						7.9
Mono											4.6	8.5					13.1
Monterey				434.0													434.0
Napa			188.5				4.0										192.5
Nevada							39.8		5.0								44.8
Orange															2668.0	250.2	2918.2
Placer							140.4				11.0						151.4
Plumas							13.9										13.9
Riverside													179.0	33.0	664.7	6.6	883.3
Sacramento							921.1	51.1									972.2
San Benito				34.1						0.3							34.4
San Bernardino												240.0	74.0	18.2	986.0		1318.2
San Diego													18.0			2633.8	2651.8
San Francisco			726.3														726.3
San Joaquin								404.6	41.6								446.2
San Luis Obispo				207.8													207.8
San Mateo			719.4														719.4
Santa Barbara				568.0													568.0
Santa Clara			1903.1	200.0													2103.1
Santa Cruz				257.6													257.6
Shasta							126.5										126.5
Sierra							2.8										2.8
Siskiyou	28.8						9.3										38.1
Solano			299.8				38.0	83.0									420.8
Sonoma		308.7	172.4														481.1
Stanislaus								0.3	345.9								346.2
Sutter							65.7										65.7
Tehama							35.6										35.6
Trinity	8.0	0.7															8.7
Tulare										261.2							261.2
Tuolumne									42.6								42.6
Ventura					1245.0												1245.0
Yolo							156.2	38.0									194.2
Yuba							68.2										68.2
Sub-basin Total	60.4	513.1	6911.5	1701.5	1695.5	8752.0	1875.0	617.8	654.8	1258.0	77.4	805.5	376.5	58.8	4318.7	2890.6	32567.7

SUBBASIN PLANNING AREAS

1-A Klamath River
1-B North Coastal
2 San Francisco Bay
3 Central Coastal
4-A Santa Clara River
4-B Los Angeles River
5-A Sacramento River
5-B Sacramento-San Joaquin Delta
5-C San Joaquin
5-D King & Kern Rivers & Tulare Lake
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6-B Lahontan (South)
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9 San Diego

1/ July 1 Estimate. See Text, Attached.
2/ As described in Text.

State of California
The Resources Agency
Department of Water Resources
November 1, 1971
Revised January 4, 1972;
March 15, 1972

32567

21.05

DEFINITIONS OF SOME BASIC ECONOMIC TERMS USED IN ANALYSIS OF RESOURCE ALTERNATIVES

A FORTIORI ANALYSIS

A procedure the purpose of which is to present a convincing comparison of the relevant alternatives being considered in an analysis. The procedure is to handicap the apparently preferable alternative by making assumptions designed to place this alternative at a disadvantage as compared with the other alternatives. See also: Sensitivity analysis.

ALGORITHM

A set of ordered procedures, steps, or rules, usually appplied to mathematical procedures, and assumed to lead to the solution of a problem in a finite number of steps.

ALTERNATIVES

Within any one agency, this term means other possible programs besides those already decided upon. It denotes a comparison of two or more programs (that is, two or more possible approaches) as possible ways of fulfilling the same objective. Used in this context the term is output-oriented; it suggests substituting an entirely different program (and therefore a different quantity or mix of outputs) for a program already planned or in process. On the other hand, alternative ways to do a job which has been decided upon takes the program as given, and raises possibilities for changing the mix of inputs.

Demand Related Internal and External Alternatives

Internal alternatives are combinations of natural resource inputs that will meet the planned objectives or demands. This could mean using different inputs or mixes, or placing the project on another area or different locations to get the outputs at a lower monetary cost plus environmental impact.

External alternatives would be meeting the demand for an output through means outside the agency. Examples in water production would be desalinization, pumping and piping from other areas, recycling, reclaiming, etc. The purpose of comparing alternatives is to find the "best" way to maximize net benefits to the public in attaining the objectives.

ANALOG METHOD OF COST ESTIMATING

A method of cost estimating which is based on historical costs that are too limited to allow statistical estimating and which is more economical to prepare than an engineering estimate. Graphical analysis is often helpful to more clearly understand the degree of relationship of the data points. The analog estimate is normally prepared by adjusting the historical cost of a similar (analog) item by deducting historical costs of components which are not comparable and adding estimated costs of new components. See also: Statistical method of cost estimating; Cost estimating relationship; Engineering method of cost estimating.

BENEFITS (KINDS OF):

Ideally, one should provide estimates of all benefits, outputs, or effectiveness expected to be received or achieved as a result of undertaking a proposed activity, program or project. Usually a particular commodity under a given activity has specific beneficial outputs--although some attendant outputs may be negative or non-beneficial.

Insofar as practical and appropriate benefits and/or outputs must be relateable to the organization's mission or function, to relevant environmental factors, and to resources or inputs invested in producing them. The period of time for which these benefits will accrue is a function of the economic life of the activity and program or project in question.

Some types of outputs will be explicitly quantifiable or measurable in terms of amount of productivity and effectiveness. Others may be in the non-quantifiable area or a mix of both. In these cases, implicit measures and narrative or qualitative aspects become increasingly important.

Actual dollar index values will be used when directly applicable. This index can be developed by using a market and non-market value approach. These values were formerly described as tangible and intangible value factors as described below:

Market and Non-Market Values

Market and non-market value is a more effective approach to identifying and approximating the value of certain types or kinds of outputs. This is approached through opportunity costs, costs of alternatives, proxy values and indicators of willingness to pay. Because of the recent large build-up in research in this area, significant improvement in non-market valuation is occurring. The basic definitions are as follows:

Market valued benefits - Goods and services valued in terms of what people are willing to pay rather than go without them.

Non-market valued benefits - Goods and services valued in terms of what reasonable people should be willing to pay rather than go without the good or service. These are imputed values.

Direct Benefits (Primary Benefits)

The value of the change in production of outputs that accrues to the direct user of the project. They are increase or gains in the value of goods and services which result from conditions with the project as compared to conditions without the project. Induced benefits are a special type of primary benefits.

Induced Benefits - Those benefits caused by increases in the production function of some other product through backward or forward linkages with direct benefits or the factors that produce it. They usually occur as "external economies" that are the result of a project or its output causing an increase in output production or the production function of some other producer. An example would be an increase in a bee keeper's honey production caused by the farmer down the road increasing the size of his apple orchard, which made more pollen available to the keeper's bees.

Non-direct Benefits (Secondary Benefits)

Oversimplified, they are the net income increase or income changes for all benefits not directly associated with the project. This net increase is based on income expansion with the project as compared to that without the project. Secondary benefits from the standpoint of economic effectiveness and efficiency are not recognized in the primary evaluation criteria. If they are part of the main project objectives, they may become a form of primary benefits.

BAYESIAN STATISTICS

A school of thought within statistics in which estimates of probabilities of events are based on the scientist's or decisionmaker's subjective beliefs as modified by empirical data. In classical statistics probability estimates are based solely on objective data. A consequence of this difference is that Bayesian statistics is considered more decision-oriented than classical statistics since the point of "enough information" for a decision is reached more quickly under Bayesian statistics. An additional aspect of the Bayesian approach which makes it more decision-oriented is that it explicitly takes into account the cost of obtaining data.

BENEFIT-COST ANALYSIS

See: Cost-Benefit Analysis.

BENEFIT-COST RATIO

An economic indicator of efficiency, computed by dividing benefits by costs. Usually, both the benefit stream and the cost stream are discounted so that the ratio reflects efficiency in terms of the present value of future benefits and costs. Benefit cost ratios should only be used to indicate whether or not a project is beneficial. It should not be used to indicate the degree of goodness except in certain well defined situations.

COEFFICENT

A number written before a quantity to indicate multiplication, that is how many times the quantity is to be taken additively. For example, in the expression 5 ax the coefficient of the quantity ax is 5 while the coefficient of the quantity x is 5a.

CONSUMER PRICE INDEX

An index number which is computed monthly by the Bureau of Labor Statistics and which is designed to show the average change in the prices of consumer goods in the United States. The items used in the development of this index are those which experience has shown to be most important in consumer spending. The index measures the average change in retail prices for a "market basket" of goods and services in major urban areas.

CONSUMER'S SURPLUS

In economics, the difference between the price that a consumer pays for a good or a service and the amount that he would be willing to pay rather than be deprived of the good or service.

CONTINGENCY ANALYSIS

A procedure employed as a result of uncertainty as to major aspects of the environment assumed in an analysis. The procedure is to vary the assumptions regarding major aspects of the environment and examine the results of the analysis in light of these changed assumptions. An example would be, in an analysis designed to disclose a preferable resource strategy from among several alternatives, we would change an assumption about public reaction. See also: Sensitivity analysis.

COST (KINDS OF):

Direct Costs (Primary Cost) - The series of direct costs that include the value of goods and services necessary for installing or building the project, and the operation and maintenance and repair that occurs over time with the project.

Associate Costs - The costs of goods and services, over and above the direct project costs, needed to make the immediate products or services of the project available for use or sale. These are costs that must be incurred before all or some of the direct (primary) benefits can be realized. These costs might be incurred by either the producer or user. Associated costs are of a more voluntary nature in that the receiver of the direct benefits may have realized the need and planned to undertake these costs to capture the benefits. An example would be the costs to a timber purchaser to remove the logs from the harvest site to mill where they can be used.

COST INDEX VALUES

Two major groupings of monetary costs should be considered with any activity. The first grouping includes Development and Installation Costs, sometimes called initial investment costs. The second grouping is primarily Operations and Maintenance. These two groups include the following where feasible or applicable:

Development and Installation Costs

1. Research and Development - If done for the particular program or project (includes project preparation and planning).

2. Initial Investment Costs - Those costs associated with the acquisition of equipment, real property, non-recurring services, non-recurring operations on maintenance (start-up) costs, and other one-time initial investment costs. Initial investment costs need not all occur in a single year.

Operation and Maintenance Costs

1. Personnel - Personnel services involved directly in the work to be performed. Costs are determined by gross G.S. rates plus contributions or wage board pay rates plus other benefits. Other personnel costs such as travel, training, per diem, etc., which pertain to performance of the activity under consideration should be included.

2. Annual Operating Costs - Includes materials, supplies, utilities, transportation, and other uses.

3. Maintenance and Repair - The cost of maintenance and repair to building structure, grounds, or land, and equipment

utilized by the activity involved in producing outputs (goods and services). Capital improvements should not be included here, but should be included with investment costs. Include only those maintenance and repair expenses directly attributable to the activity or program or project under analysis.

4. Associated Costs - The costs of goods and services, over and above the direct project costs, needed to make the immediate products or services of the project available for use or sale. These are costs that must be incurred before all or some of the direct (primary) benefits can be realized.

Induced Costs - All uncompensated adverse effects caused by the construction and operation of the project. These are "external" diseconomies or impacts that may cause a decrease in the production of some other output or additional costs to maintain or continue production of other outputs. These include increases in cost of local Government services directly resulting from the project and any adverse effects on the economy such as increased transportation costs. It is different from an opportunity cost in that it doesn't represent any previous benefit foregone, but only the additional costs incurred.

COST-BENEFIT ANALYSIS
(Benefit-Cost Analysis)

An analytical approach to solving problems of choice. It requires the definition of objectives, identification of alternative ways of achieving each objective, and the identification, for each objective, of that alternative which yields the greatest benefit for a given cost or that alternative which produces the required level of benefits at the lowest cost or that alternative which yields the greatest net present value. This same analytical process has also been referred to as cost effectiveness analysis when all the benefits or outputs of the alternatives cannot be quantified in terms of dollars.

COST-EFFECTIVENESS ANALYSIS

See: Cost-benefit analysis.

COST ESTIMATING RELATIONSHIP (CER)

Any numerical relationship which is useful in computing estimated costs of materials or activities. These relationships range from simple averages and percentages to complex equations derived by regression analysis which relate cost (dependent variable) to physical and performance characteristics (independent variable). The CER shows how value of these independent variable are converted into costs.

DELPHI METHOD

A recently developed technique, the purpose of which is to arrive at a consensus regarding an issue under investigation. It consists of a series of repeated interrogations, usually by means of questionnaires, of individuals whose opinions or judgments are of interest. After the initial interrogation of each individual, each subsequent interrogation is accompanied by information regarding the preceding round of replies. The individual is thus encouraged to reconsider and, if appropriate, change his previous reply in light of the replies of other members of the group.

DEMAND

(Operational Use) - Estimates of the quantity of various outputs the public wants--similar to a concept of consumption or use--and would use (assuming no change in user costs) relative to specific geographic areas. Forecasted demands of this type relate to what people in a given area will likely want--given user's costs.

(Economic Demand) - Economic demand and use are not synonymous. Demand is the amount of a commodity or output that people would consume at various user cost levels (including fees) if the supply of opportunities were not limiting. Changes in the reported use over time may be the result of changes in demands, or changes in supply, or changes in reporting systems or their accuracy. There can be a demand for a commodity, but no use will occur if there is no supply of opportunities. If the supply of opportunities is not constraining use, then use will reflect demand, assuming prices are constant or negligible. Projections of use must, therefore, be based on particular assumptions or data on supply, costs and fees.

DIMINISHING MARGINAL UTILITY

The principle that, as the level of consumption of a good per unit of time is increased, a point is reached where each additional unit consumed provides less utility than did the preceding unit.

DIMINISHING RETURNS

The economic principle that, as there is an increase in the quantity of any variable input which is combined with a fixed quantity of other inputs, the marginal physical product of the variable input must eventually decline. For example, additional application of capital to a fixed quantity of land and labor may result in an increase in total output, but eventually the additional output and then the average output asscoiated with each unit of the variable input (capital) will begin to drop.

Effectiveness

The performance or output received from a given approach or a program. Ideally it is a quantitative measure which can be used to evaluate the performance level achieved in relation to criteria pertaining to end objectives. An example of such a measure would be the increase in annual earnings of a group of participants in a Federal retraining program. Under this example, a measure of output, such as the number of people who completed the program, while informative, would not be a valid measure of effectiveness since the objective is to increase income, not merely to retrain people.

Elasticity (Price)

In economics, a measure of the responsiveness of the quantity demanded or supplied to changes in price. Elasticity measures the degree to which price is effective in calling forth or holding back changes in the quantity bought or sold.

Engineering Method of Cost Estimating

A traditonal means of cost estimating which depends on a well-defined description of a proposed system, availability of detailed bills of material, detailed operations, and specialized judgment. The method produces good results for systems involving standard components and no high-risk developments.

ECONOMIC LIFE

The period of time over which the benefits to be gained from a program or project may reasonably be expected to accrue to the Forest Service or public. Although economic life is not necessarily the same as physical life or technological life, it is significantly affected by both the obsolesence of the investment itself and the purpose it is designed to achieve. The economic life of an investment program or project begins in the year in which the investment starts. Thus, it is possible that the investment costs may occur several years prior to the time the project start producing benefits.

EXTERNALITY

An economy or diseconomy, that is, a benefit or an undesirable effect, which accrues to an entity as a result of an action which is initiated by another entity and over which the recipient entity has no direct control.

FREE GOOD

A good (or service) that is so abundant, in relation to the demand for it, that it can be obtained without paying money, without exchanging another good, or without self-exertion.

HEURISTIC

Solution of a problem by a trial and error approach frequently involving the act of learning, and often leading to further discovery or conclusions without providing proof of the correctness of the outcome.

INCREMENTAL COST

The cost associated with a change in the level of output. For example, if presently the total cost of production is $100,000 and under a planned increase in volume the total cost would be $125,000, the incremental cost would be $25,000. The term differential cost is also used to refer to this type of cost.

MARGINAL ANALYSIS

The process of identifying the benefits or costs of alternative behaviors as unitary changes in the alternative variables occur. It involves comparing alternatives in terms of changes in benefits per one unit change in resource inputs. Ideally, the objective would be to equalize the ratios of changes in benefits per one unit change in input for all alternatives.

MARGINAL ANALYSIS

Conditions which must be fulfilled if an operation is to attain an optimum, for example that marginal revenue equal marginal cost is a "first-order condition," that the excess of marginal revenue over marginal cost must have been declining just prior to this point of equality is a "second-order condition."

MARGINAL COST

In a marginal analysis (see above), the change in total cost due to a one-unit change in output. It is a special case of the more general term incremental cost.

MARGINAL COST PER UNIT OF INPUT
(sometimes called Marginal Revenue Costs or MRC)

The change in total cost resulting from a one-unit change in a variable input.

MARGINAL PHYSICAL PRODUCT OR MPP

The change in total physical output resulting from a one-unit change in a variable input.

MARGINAL REVENUE

The change in total revenue due to a one-unit change in output. See also: Marginal Cost.

MARGINAL REVENUE PER UNIT OF IMPUT OR MRI
(sometimes called Marginal Revenue Product or MRP)

The change in total revenue resulting from a one-unit change in a variable input.

MARGINAL UTILITY

The change in total utility due to a one-unit change in the quantity of a good or service consumed, for example, the additional satisfaction that a purchaser derives from buying an additional unit of commodity or service. Marginal utility is a psychological rather than an objectively measureable concept.

MODEL

A representation of the relationships that define a situation under study. A model may be a set of mathematical equations, a computer program, or any other type of representation, ranging from verbal statements to physical objects. Models permit the relatively simple manipulation of variables to determine how a process, object, or concept would behave in different situations.

Deterministic Model

A model in which the variables take on only definite values, that is, a model that does not permit any risk as to the magnitude of the variables. For example, a set of simultaneous equations for which there is a unique solution.

Probabilistic Model

A model in which each variable may take on more than one value. Such models are sometimes called stochastic which means, literally, "making a best guess."

MONTE CARLO METHODS

A catch-all label referring to methods of simulated sampling. When taking a physical sample is either impossible or too expensive, simulated sampling may be employed by replacing the actual universe of items with a universe described by some assumed probability distribution and then sampling from this theoretical population by means of a random number table.

OPPORTUNITY COST

The measureable advantage foregone as a result of the rejection of the next best alternative use of resources. The opportunity cost related to a decision to have the Government invest funds in an activity would be the benefits which would be derived on those funds if they were allowed to remain in the private sector of the economy.

PECUNIARY SPILLOVER

A spillover which is monetary rather than physical in nature and which causes a change in the monetary valuation of a physical input or output, but does not change the relationship between physical inputs and physical outputs. For example, an acceleration of an Engineering program might cause a short-run shortage of professionals and technicians thus increasing the costs of similar services to other industries but not necessarily changing the physical productivity of these inputs to the other industries.

POINT ESTIMATE

An estimate which states that the characteristic of interest has a single, specific value. It is the single best estimate of a population value made from a sample. This may be contrasted with an interval estimate which states that the population value of interest falls somewhere within a range or interval.

PROBABILITY

The ratio of the number of outcomes that would produce a specific event to the total number of possible outcomes or, in other words, the likelihood of a specific event occurring. It is expressed as number in the range from zero to one or as a percentage.

Subjective Probability

A probability for which historical evidence is not available for decisionmaking. The decisionmaker must therefore rely on his own estimation of the likelihood of various possible outcomes.

PROBABILITY DISTRIBUTION

A model for the prediction of the relative frequencies with which possible values of a variable will occur. Often it is developed on the basis of and presented in a manner similar to a frequency distribution. There are two types: (1) discrete, in which the variable can assume only specific values (usually integer values 0, 1, 2...) for example, the number shown on a die, or number of baseballs lost in a game, and (2) continuous, in which the variable can assume any value (or any value within a specified interval) for example, the amount of rainfall per month.

RISK

"Measureable uncertainty" per the economist Frank Knight. In decision theory, the distinction is made that risk is measurable while uncertainty is not. In situtations of risk, the probabilities associated with potential outcomes are known. The term may be associated with situations of repeated events, each individually unpredictable but with the average outcome highly predictable. In situations of uncertainty, the probabilities are not known but can be guessed (see Subjective Probability).

SECONDARY BENEFITS

Benefits from a project that accrue indirectly to an external entity. An example of derived secondary benefits is the increased net income of rancher and others from processing, transporting, and selling products in the area because of a F.S. range management project. An example of an induced secondary benefit resulting from the project would be the net income of a new sports store that located in the project area solely because of the project.

SENSITIVITY ANALYSIS

A procedure employed as a result of uncertainty as to the actual value of the parameter or parameters included in an analysis. The procedure is to vary the value of the parameter or parameters in question and examine the extent to which these changes affect the results of the analysis. For example, if an analysis indicates that Program A is preferable to program B, sensitivity analysis might be performed by increasing a factor such as size of the group to which the programs are directed and then examining the results of the analysis under this change.

SHADOW PRICE

An imputed value; and exchange rate other than a market price. In economics (especially in appraisal of public investment projects), the estimates of the intrinsic value of the scarce factors of production available. Shadow prices may be used when market prices (particularly those of capital and labor) diverge from the values that would prevail if (1) the investment under consideration were actually carried out, and (2) no fundamental disequilibria existed in the market.

In linear programming the shadow price is the amount of change in objective achievement per marginal change in some constraint.

SPILLOVER

An economy or diseconomy for which no compensation is given (by the beneficiary) or received (by the loser). Spillover is sometimes synonymous with externality and with external economy or external diseconomy. See also: Secondary benefits which is a closely related concept.

SUNK COSTS

Costs which have already been incurred and will not be increased or decreased by a decision made either now or in the future. Therefore such costs have no relevance to decisions regarding future action. For example, in making a decision as to whether a new office should be constructed, the construction cost of the existing office is a sunk cost.

STATISTICAL METHOD OF COST ESTIMATING

A method of cost estimating utilizing statistically determined cost estimating relationships which express cost as a function of the characteristics specified for the case in question. A valuable aspect of statistical estimating is that an objective statement regarding cost uncertainty can be provided. See also: Analog method of cost estimating, and Cost estimating relationship.

TECHNOLOGICAL SPILLOVER

A spillover which affects the relationship between physical outputs and physical inputs of some external entity which does not pay or receive payment for the spillover. For example, chemical fumes from an industrial plant which reduce (or increase) the yield of crop land. See also: Pecuniary Spillover and Spillover.

TIME SERIES

A display of data showing the magnitude of the same phenomenon at various points in time. An example would be a display of the population at ten-year intervals from 1900 to 1970.

UNCERTAINTY

In general, uncertainty and risk are used as synonymous terms. A distinction sometimes made between risks and uncertainty is that an event may be risky if a probability distribution can be ascertained. It is uncertain if the probability of success or failure cannot be ascertained.

WELFARE ECONOMICS

The study of the economic well-being of all persons as consumers and as producers, and possible ways in which that well-being may be improved. It is also known as normative price theory.